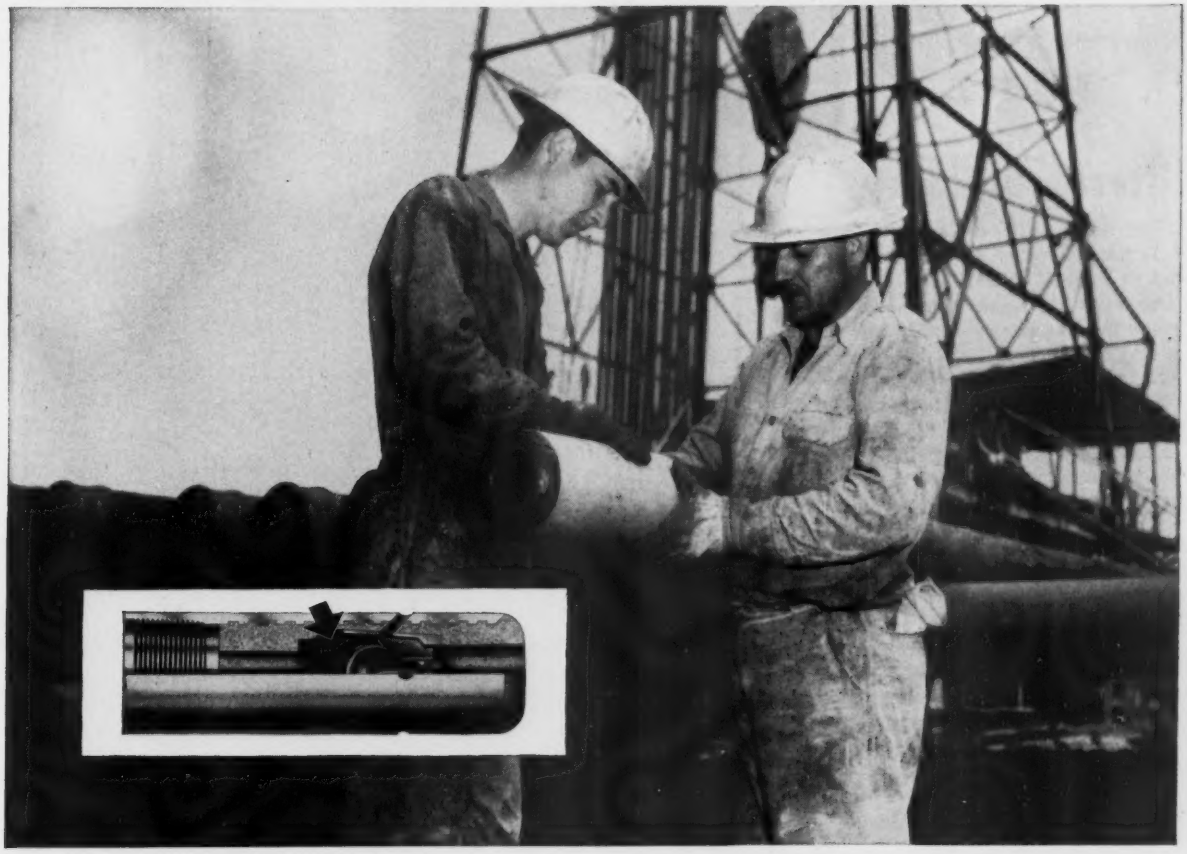
***Another new development using***

# B. F. Goodrich Chemical *raw materials*



## VERSATILE MATERIAL FOR THE TOUGH JOBS!...Hycar phenolic

HYCAR-phenolic compounds are used for many tough jobs in many industries. The application pictured here is a float shoe, used in oil well work. The float shoe seat is made of Hycar and phenolic resin. It seals tightly against extreme pressures encountered in running long strings of pipe. It resists the cutting action of abrasive cement slurry and again seals tightly after cement is placed. It withstands high bottom hole temperatures in the 350-400° F. range.

Compounds based on Hycar-phenolic resins are noted for their many advantages. In addition to heat, oil and chemical resistance, they possess better resistance to shock, vibration and fatigue than ordinary rigid materials. In processing, they provide good molding characteristics . . . easy flow in the mold. Designers are finding more and more uses for these versatile compounds.

Perhaps a Hycar rubber compound can help you solve a difficult problem—help you improve or develop more saleable products. For technical information, please write Dept. HB-6, B. F. Goodrich Chemical Company, Rose Bldg., Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ont.

**B. F. Goodrich Chemical Company**
**A Division of The B. F. Goodrich Company**

**Hycar**
Reg. U.S. Pat. Off.
*American Rubber*

**GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers • HARMON colors**

# Filtered Philblack*

Filter-tip cigarettes can't hold a candle to the "filter-tips" of our Philblack plant in Borger, Texas.

***Our engineers were determined to remove the last bits of Philblack from the off gas and smoke which had been a source of annoyance to the community since carbon black plants were established in that area.***

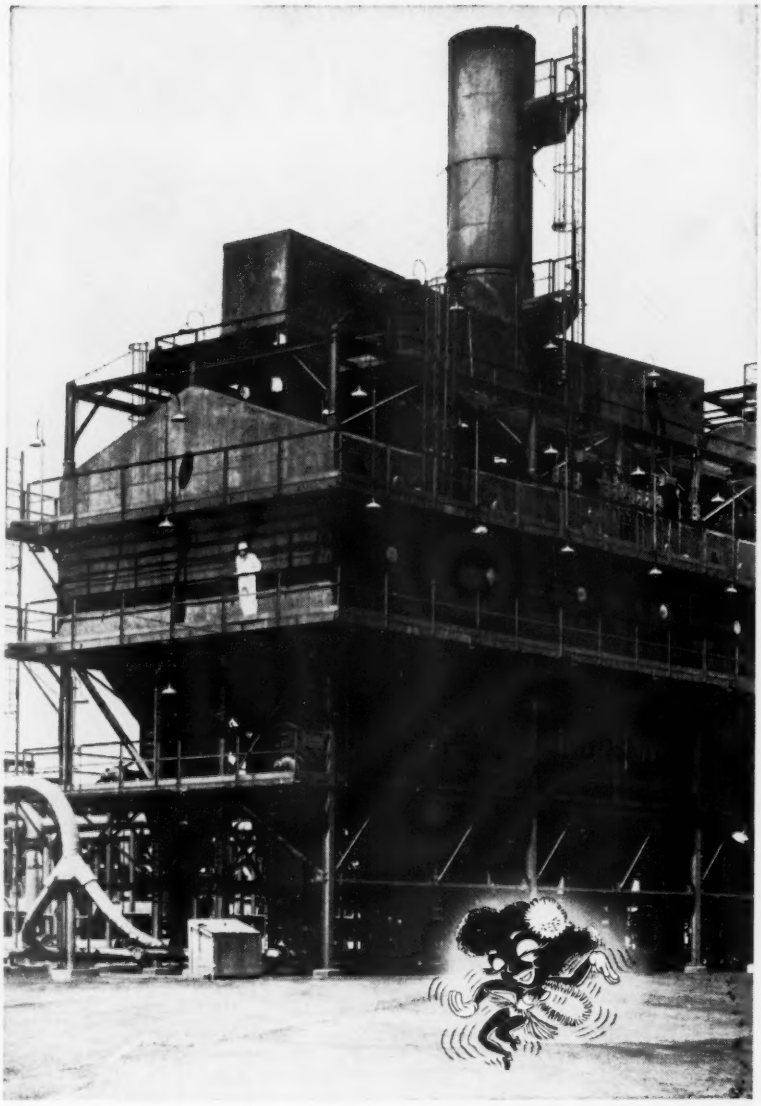
After much study, a gigantic structure supporting thousands of Orlon bags was constructed beside our electrical precipitators. As Philblack collects on the bags, a cam mechanism agitates the filters with a hula-hula motion. Philblack thus recovered is then conveyed for concentration and shipping.

***Solving problems involving carbon black is a Philblack specialty. Our background is unusually complete, too. For many years a major portion of Phillips research has been devoted to synthetic rubber and carbon blacks, and to the proper compounding of these materials. We are thoroughly familiar with the handling of elastomers from the first processing of raw materials to the evaluation of finished products.***

Ask your Philblack technical representative for his help with your carbon black and rubber problems. His recommendations are backed by a resourceful staff of rubber chemists and engineers experienced in the special skills of your business.

***We are glad to hear from you at any time: Phillips Chemical Company, 318 Water Street, Akron 8, Ohio.***

*A TRADEMARK



**Operating efficiency** of this Philblack filter has increased steadily since it was put on stream. And thanks to persistent effort, the over-all cost of operating this plant has increased very little in the face of continuously rising costs for labor and materials. Whenever you want to step up your efficiency and cut costs at the same time, your Philblack Technical representative is a good man to consult. His technical training has one basic aim: to help Philblack customers and prospective customers improve the economics of their operations.

## *Know the Philblacks!* KNOW WHAT THEY'LL DO FOR YOU!

**A** **Philblack A FEF Fast Extrusion Furnace**
Ideal for smooth tubing, accurate molding, satiny finish. Mixes easily. High, hot tensile. Disperses heat. Non-staining.

**I** **Philblack I ISAF Intermediate Super Abrasion Furnace**
Superior abrasion resistance at moderate cost. Very high resistance to cuts and cracks. More tread miles at high speeds.

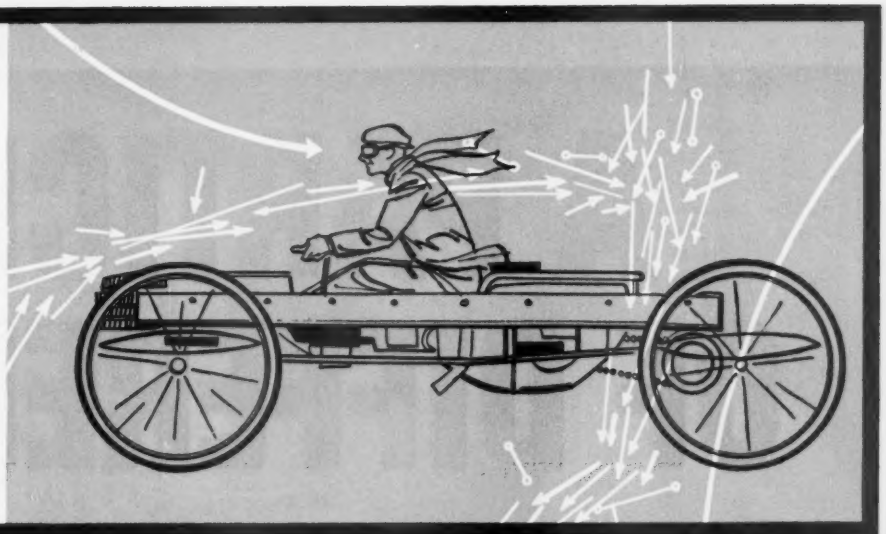
**O** **Philblack O HAF High Abrasion Furnace**
For long, durable life. Good electrical conductivity. Excellent flex. Fine dispersion.

**E** **Philblack E SAF Super Abrasion Furnace**
Toughest black on the market. Extreme abrasion resistance. Withstands aging, cracking, cutting and chipping.

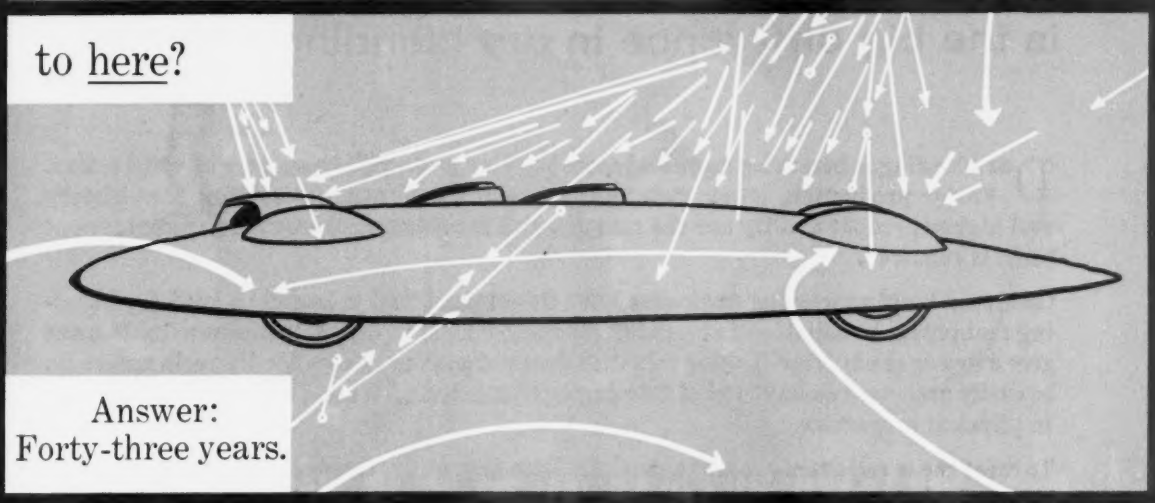
Phillips 66

**PHILLIPS CHEMICAL COMPANY,** Philblack Sales, 318 Water Street, Akron 8, Ohio. Export Sales: 80 Broadway, New York 5, N. Y. West Coast: Harwick Standard Chemical Company, Los Angeles, California. Canada: H. L. Blachford, Ltd., Montreal and Toronto.

How long did it take to get from here



to here?



Answer:
Forty-three years.

From the perky, wire-wheeled Stevens-Duryea Skeleton which whizzed around the track at Dayton, to the low-slung, torpedo-shaped Railton of John Cobb, there is an entire history of automobile development.

Partner in this development is Monsanto with its group of rubber chemicals, which have done—and are still doing—so much to improve tires and other rubber products.

One of these products is Monsanto's Insoluble Sulfur 60, which offers an economical and convenient way to use insoluble sulfur when such is indicated in the compound.

For more information on this and other products, write today for your copy of new catalog "Chemicals for the Rubber Industry," to MONSANTO CHEMICAL COMPANY, Rubber Service Department, 920 Brown Street, Akron 11, Ohio.

MONSANTO
CHEMICALS AND PLASTICS

SERVING INDUSTRY...
WHICH SERVES MANKIND

MONSANTO CHEMICALS FOR THE RUBBER INDUSTRY

ANTIOXIDANTS
Flectol* H
Santoflex* B
Santoflex BX
Santoflex 35
Santoflex AW
Santowhite* Crystals
Santowhite MK
Santowhite L
Santowhite Powder
ALDEHYDE AMINE ACCELERATORS
A-32
A-100

MERCAPTO ACCELERATORS
Santocure*
El-Sixty*
Mertax (Purified Thiotax)
Thiotax (2-Mercapto benzothiazole)
Thiofide* (2,2' dithio-bis benzothiazole)

GUANIDINE ACCELERATORS
Diphenylguanidine (D.P.G.)
Guantal*

ULTRA ACCELERATORS FOR LATEX, ETC.
R-2 Crystals
RZ-50
RZ-50-B
Pip-Pip
Thiurad* (Tetramethyl-thiuram disulfide)
Ethyl Thiurad (Tetraethyl-thiuram disulfide)
Mono Thiurad (Tetramethyl-thiuram monosulfide)
Methasan* (Zinc salt of dimethyl dithiocarbamic acid)
Ethasan* (Zinc salt of diethyl dithiocarbamic acid)
Butasan* (Zinc salt of dibutyl dithiocarbamic acid)

PLASTICIZERS
DOP
Dibutyl Phthalate
Tricresyl Phosphate
Dioctyl Adipate
Santicizer* Plasticizers
SPECIAL MATERIALS
Thiocarbanilide ("A-1")
Santovar*-A
Santovar-O
Sulfasan R
Insoluble Sulfur "60"
COLORS
REODORANTS

*Reg. U. S. Pat. Off.

# A PARTICLE OF DIFFERENCE

is the big difference in dry blending PLIOVIC

DRY blending is becoming more and more popular among all processors of vinyl resins. Faster production, lower costs, less expensive equipment, a shorter heat history and higher product quality are the reasons. But to achieve such results, a special type of resin is required.

Goodyear vinyl processing engineers have determined that primarily a good dry blending resin must be capable of absorbing plasticizer at a rapid yet uniform rate. It must give a dry or sandy, free-flowing mix that does not pack or bridge. Such a resin must also be easily processed on any type of forming equipment. And it must do so with no sacrifice in physical properties.

To meet these requirements for a good dry blending resin, Goodyear vinyl resin specialists worked out monomer types and ratios, molecular weights, and methods of polymerization. But the most important findings were the particle size, type and distribution that spelled the difference in producing a good dry blending resin.

By using the most modern techniques available, vinyl resin particles were produced in the desired size, shape and structure. The size range was confined within very narrow limits. And the results were outstanding PLIOVIC DB (dry blending) resins for extruding, calendering and molding.

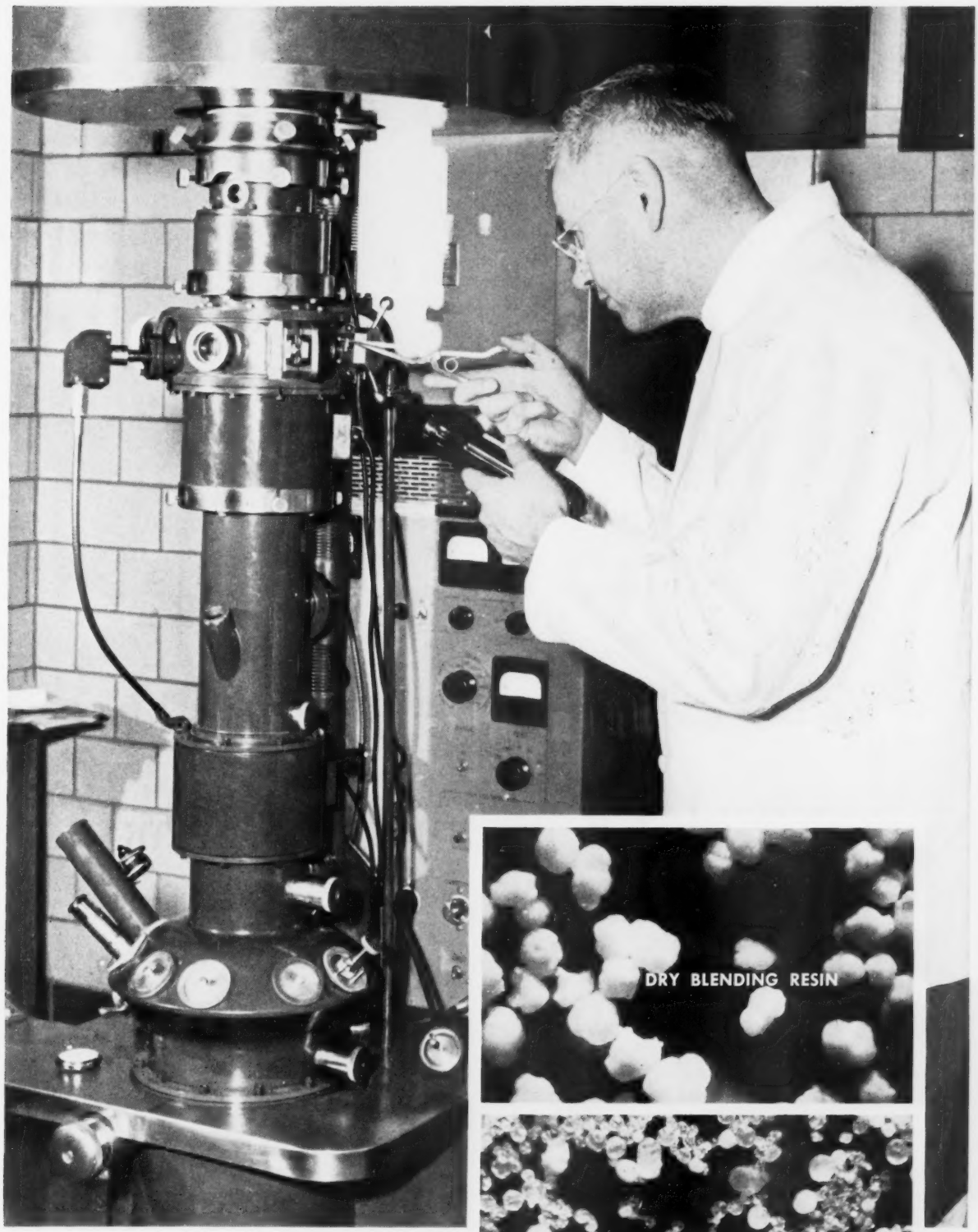
And the work continues. While the PLIOVIC dry blending resins are the finest to reach the market to date, even greater PLIOVIC resins are in the offing. For samples and technical assistance, write to:

Goodyear, Chemical Division, Akron 16, Ohio.

CHEMICAL GOODYEAR DIVISION

Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T.M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

**Use-Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry**




**THE DIFFERENCE IN PARTICLES** that gives you better dry blending PLIOVIC resins is obtained with the help of this electron microscope which magnifies from 5 to 50,000 times. In these photomicrographs, note the uniformity in size, shape and structure of the particles of the dry blending resin as compared to those of the conventional resin.

# Now...SILENE® in unitized shipments!

## SAVES TIME AND MONEY • REDUCES PACKAGE BREAKAGE

Now you can add the benefits of unitized shipping to the many advantages of Silene, the quality rubber pigment.

Silene's compact 50 lb. packages are ideally suited to the new Uni-board which Columbia-Southern® furnishes at no extra cost in unitized shipments.

The Uni-board is a solid fiber board which measures 48 inches by 52 inches with a 4-inch scored lip folded on the 52-inch side. This Uni-board enables quick, easy transporting of up to 48 Silene bags at one time! Only chisel-type forks on the forklift can be used.

This unitized handling of Silene offers several big advantages.

1. **You can store better**
2. **Unload quicker**
3. **Save on handling**
4. **Reduce package breakage**
5. **And, you're always sure of minimum carload weight**

Profit now from using Silene and from unitizing shipments. Contact Rubber Pigments Section at our Pittsburgh Office without further delay.

**COLUMBIA-SOUTHERN CHEMICAL CORPORATION**
SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY
ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

COLUMBIA-SOUTHERN

DISTRICT OFFICES: Cincinnati • Charlotte
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St. Louis • Minneapolis • New Orleans • Dallas
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# RUBBER FABRICATORS NEED ACCURATE CUTTING DIES

For Cutting

**Rubber, Neoprene, Plastics, etc.**
**Sheeting, Foam, Sponge, Cellular,**
**Cured & Uncured**

***Gang Dies Our Specialty***

- Accuracy to close Tolerances
- Durability
- Genuine Understanding of the problems of rubber goods manufacturers

## MALLET HANDLE DIES

PURPOSE — For those who have no machinery and do not wish to purchase any. For Cutting — Rubber, Neoprene, Plastics, etc.

ADVANTAGE — Cut direct from bolts or not.

SERVICE—One to three days.

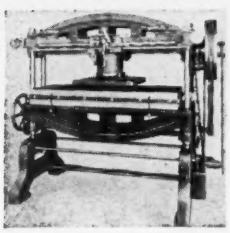
## STEEL RULE CUTTING DIES

Used on Die Cutting Press, Printing Press or Power Press

PURPOSE — Especially suited for cutting — Rubber, Neoprene, Plastics, etc.

ADVANTAGE—Low in cost. Suitable for long production runs. It is necessary to cut from rectangular sheets which are fed into the press.

SERVICE—One day service.



## STEEL RULE CLICKER DIES

Use On Clicker Machine or Dinker Press

PURPOSE—For Cutting Rubber, Neoprene, Plastics, etc.

ADVANTAGE — More reasonably priced than the all steel dies. Recommended for small and medium quantities where cost of an all steel die is not warranted.

SERVICE—One day service.

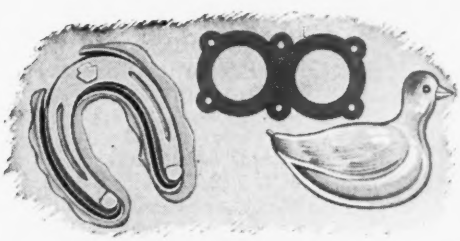
## ALL STEEL DIES

Use On Clicker Machine or Beam Press or Power Press

PURPOSE—For Cutting—Rubber, Neoprene, Plastics, etc.

ADVANTAGE — Cut direct from rolls without first cutting into sheets.

SERVICE—One to three day service on dies.



**Dies for cutting**
**Gaskets, flashing from molded parts, rubber soles, foam and sponge for furniture padding, inflated toys, clothing and footwear, etc.**

## DIE CUTTING SERVICE

PURPOSE—For those who prefer to have their cutting done by others.

ADVANTAGE—We can die cut your product for you on our own presses rapidly and economically at a low "per thousand" cost.

SERVICE—One to three days.

**SAME DAY SERVICE**

# ACCURATE

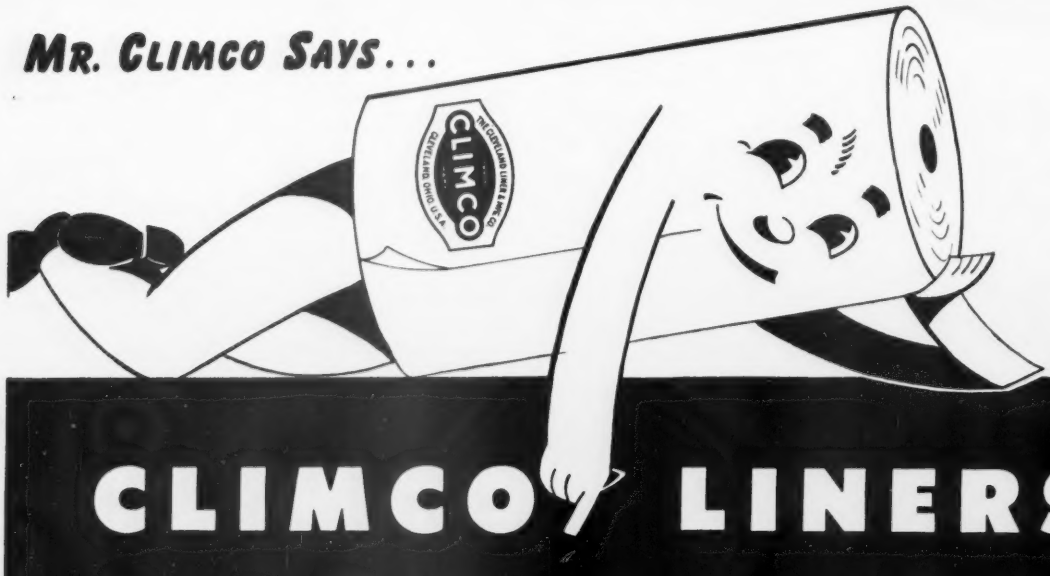
**STEEL RULE DIE MANUFACTURERS**

**24-28 West 21st Street, New York 10, N. Y. CHelsea 2-0860-1**

Subsidiaries: American Fabricators; Interstate Die Cutting Co., Inc.

*Intelligent Service to the Rubber Goods Industry for Over 23 Years*

## MR. CLIMCO SAYS...




# CLIMCO LINERS

## Permit Horizontal Storage of Stock

Horizontal storage is usually easier and more efficient — vertical storage has a tendency to curl the edges of the stock and liner, causing stock losses. When your liners are Climco Processed, you can confidently store them horizontally because the pressure of the roll will not cause sticking.

Climco Processed Liners will help you — whatever your method of storage.

They speed work by stopping stock adhesions and insuring easy separation. The life of your liner is increased, tackiness of the stock is preserved and loss of stock reduced. In addition to these production benefits, Climco Processed Liners protect the stock itself in many important ways.

Since 1922 Climco Processed Liners have proved their worth to the rubber industry. Give them a trial in your plant.

**ILLUSTRATED LINER BOOKLET**

Tells all about Climco Liners and Linerette and how to get better service from liners. Write for your copy now.

**THE CLEVELAND LINER & MFG. CO.**
**5508 Maurice Ave. • Cleveland 27, Ohio, U.S.A.**
*Cable Address: "BLUELINER"*

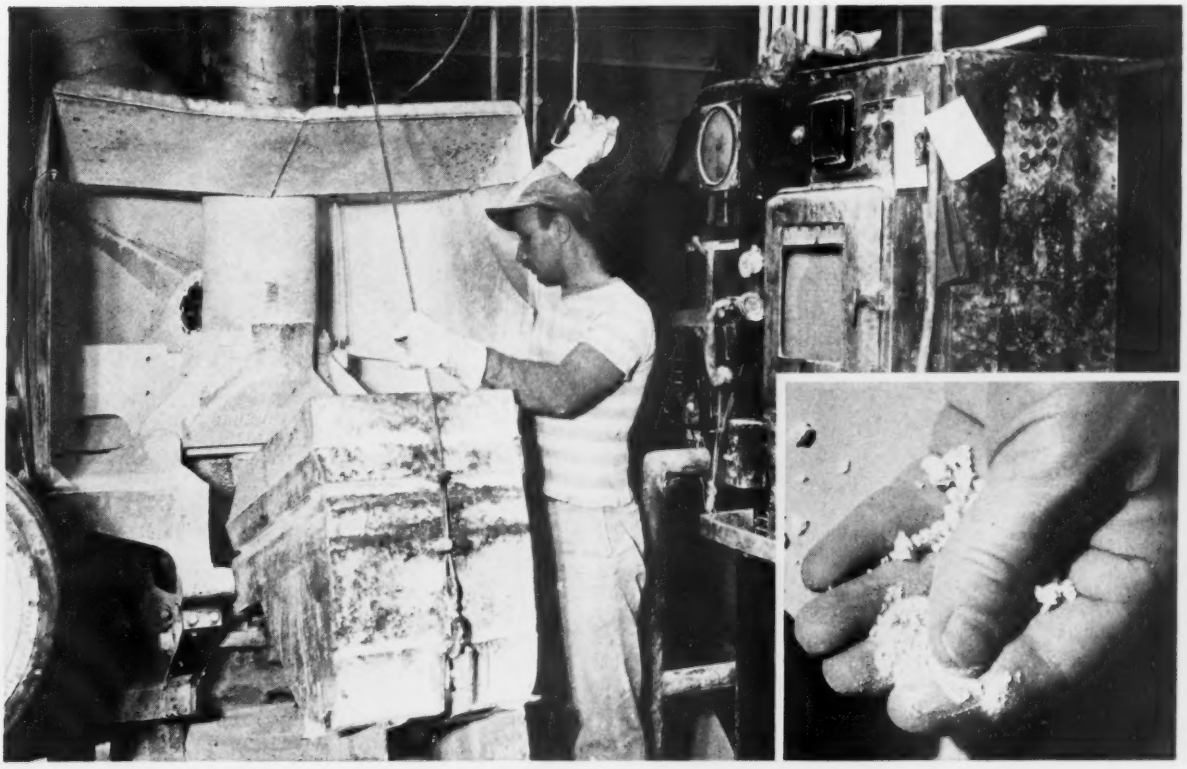
**LINERETTE**
**INTERLEAVING PAPER**
*Treatment Contains*
**NO OIL OR WAX**
*Samples on Request*

# CLIMCO PROCESSED LINERS

CLIMCO — THE CLEVELAND LINER & MFG. CO. — CLEVELAND, OHIO U.S.A.

*SERVING THE RUBBER INDUSTRY FOR 32 YEARS*

**MUCH LESS FLY LOSS** than pictured here is yours when you use easily friable (see inset), minimum dusting granules of PLIOLITE S-6B. More usable reinforcement per pound of resin, better working conditions, lower costs result.



# SAVE RESIN—SAVE MONEY

*on shoe sole stocks with granular* PLIOLITE S-6B

PICTURED above is what your Banbury *won't* look like, if you use PLIOLITE S-6B—the *first* rubber-reinforcing, high styrene-butadiene copolymer to be supplied in easily friable, minimum dusting granules.

This granular form not only means less fly loss during mixing, but also permits maintenance of uniformity that results in a constant, higher bulk density. And this spells lower costs through smaller, more manageable bags and larger Banbury charges.

Moreover these granules quickly break down into a fine powder to give you an easier, faster, more thorough dispersion—more reinforcement per pound—and a better combination of shoe sole properties – than any other reinforcing resin. You can prove all this in your own laboratory with the generous samples and technical assistance that come from writing to:

Goodyear, Chemical Division, Akron 16, Ohio

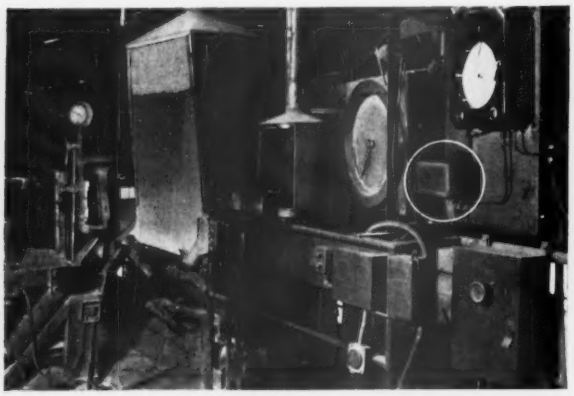
CHEMICAL GOODYEAR DIVISION

Chemigum, Pliobond, Pliolite, Plio-Tuf, Pliovic—T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

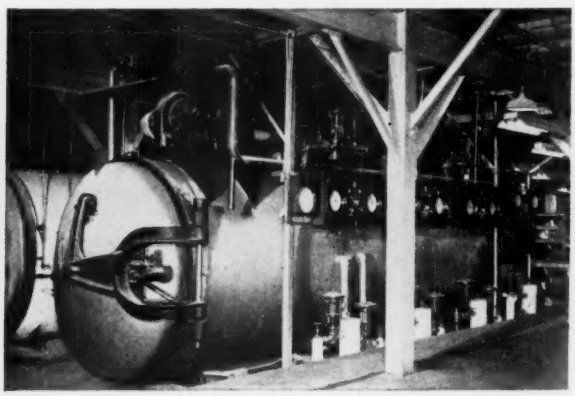
**Use-Proved Products — CHEMIGUM • PLIOBOND • PLIOLITE • PLIO-TUF • PLIOVIC • WING-CHEMICALS — The Finest Chemicals for Industry**

# Who controls the RUBBER INDUSTRY ?

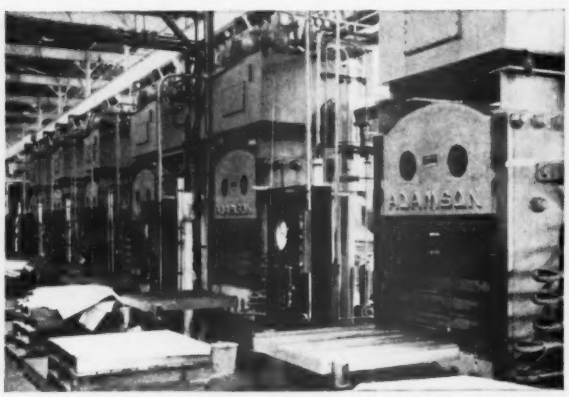
WHEN it comes to control of the various processes involved in the production of the finished article, Taylor instruments play an important role. From the accurate measurement and control of the mix in a Banbury, to the fully automatic control of modern tire presses, there are Taylor systems designed to save you money; help maintain product quality. Call your Taylor Field Engineer. Or write Taylor Instrument Companies, Rochester, N.Y.; Toronto, Canada.



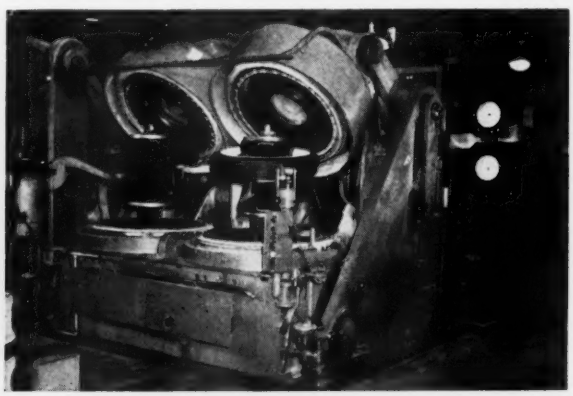
**On this Banbury mixer** the rugged yet highly responsive measuring system of the TRANSAIRE® Temperature Transmitter (circled) compensates for the poor heat transfer of the mix. The FULSCOPE® Controller accurately records and controls the time and temperature of each batch. Cuts out heat deterioration worries—and risk of fire.



**A Taylor control system** masterminds the operation of these boot and shoe vulcanizers. Steam temperature to the heating coils and air pressure inside the vulcanizers are both controlled, while the system automatically times the cycle, shuts off the air and vents the vulcanizer.




**Taylor controls** the entire operation of these multi-platen presses, from closing to opening. In addition, steam pressures are automatically regulated and recorded, condensate temperature is recorded—and condensate is disposed of at adjustable repeating intervals.



**The sequence and duration** of all the functions of this Bag-O-Matic Press are automatically controlled by Taylor instrumentation, from closing to opening of the press. This includes control of press temperature and condensate removal in each cavity, and the recording of bag pressure to each press.

**Taylor Instruments MEAN ACCURACY FIRST**

# Penny-Pincher...

# CYCOLAC

A *New* HIGH-IMPACT THERMOPLASTIC RESIN

**gives you greater all-around ECONOMY in production!**

Here at last is a single uniform resin which is permanently thermoplastic, permitting fast molding, calendering and extruding, and re-use of trim and cutting scrap.
Cycolac is also economical to form from press-polished sheets by vacuum, air-pressure, or mechanical methods over inexpensive molds of wood, plaster, aluminum, etc.

Cycolac is free from nerve or shrinkage, permitting accurate calendering and extruding. High in impact-resistance and heat-distortion temperatures; low in brittle point. Also very light with Sp. Gr. of 1.01. Capable of being colored to about any opaque shade. Capable of being solvent or heat-welded; can be machined much like other rigid thermoplastics.

GET THE FACTS — *Write* TODAY FOR TECHNICAL LITERATURE

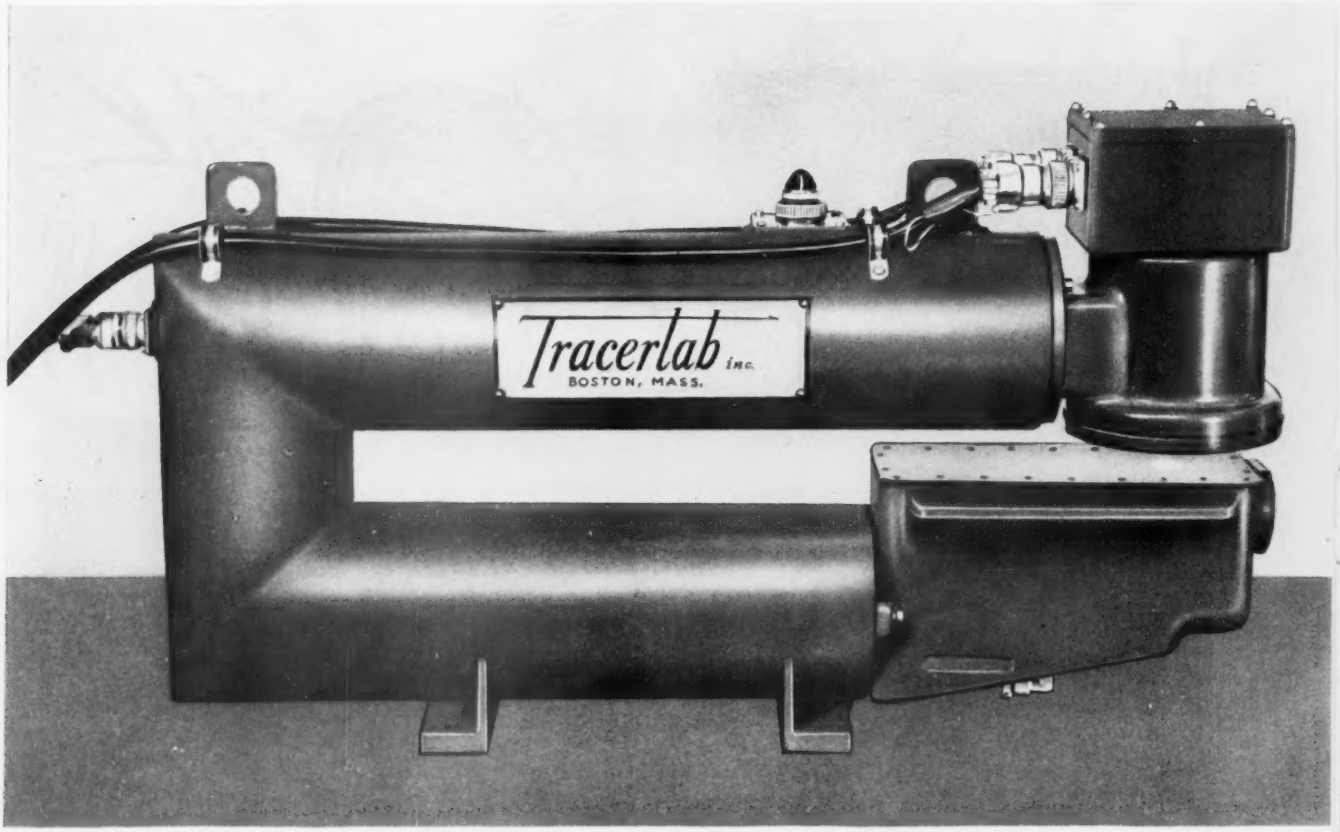
Marbon

## MARBON CORP.

**GARY, INDIANA**

SUBSIDIARY OF BORG-WARNER

MARBON . . . *Precision Resins for Precision Made Products*




# *Here's the NEW*

## CESIUM-137 BG-5 LIGHT MATERIALS BETA GAUGE

### Designed specifically for those mills producing light materials

Mills running light, critical materials may now use Beta Gauges to insure better product uniformity, cut raw material costs, and increase production. Tracerlab — the firm that made the first Beta Gauges — has licked the problem of using Cesium-137 as a source material. Its long-life, low energy beta rays make possible *for the first time* the gauging of the lightest materials with unexcelled stability and accuracy. Into the design and production of the new BG-5 have gone all the skills and knowledge amassed through the production and sale of the large majority of all beta gauges now in use. The BG-5 will enable you to:

- **Cut raw material costs by running closer to minimum tolerance.**
- **Increase production by producing more first quality product.**
- **Enable you to get "on gauge" quicker, thus reducing wastage and off-goods.**
- **Improve quality by maintaining production standards. Continuous inspection vs. unreliable "spot" checking.**
- **Recorder accessory provides 24-hour production record of material variations.**

The BG-5 Light Materials Beta Gauge can be used in automatic control arrangements; can be obtained with a variety of recorders; is equipped with a "C" frame having a throat depth to meet your requirements; has "all-angle" scanning mounts that provide across-the-sheet profiles.

Here's the answer to your control and quality problems . . . at a cost that any mill can afford. The details await your request.

*GET THE FACTS NOW!!! There's a Tracerlab Beta Gauge direct-factory representative in your area waiting to demonstrate a gauge and tell you the full story of how the BG-5 can save you money. Write today to arrange a visit, and to get further information. Tracerlab, Inc., 131 High Street, Boston 10, Massachusetts.*

Tracerlab® inc.

**BETA GAUGE**

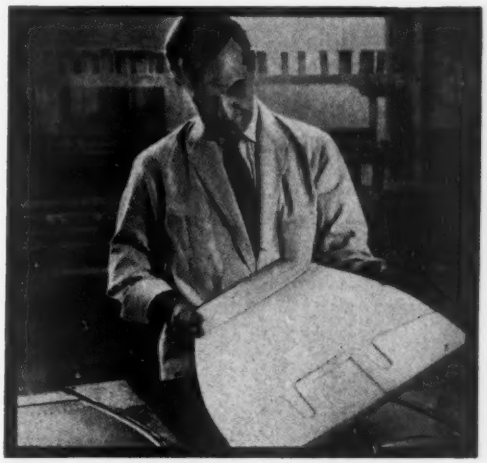
A girdle is being stripped off a phenolic dipping form cast from Marblette resin #71 at a cost of $6 as opposed to about $70 for original patterns. Additional accurate Marblette pattern duplicates, held upright in metal shoes after the girdles have been removed from them, stand by for ready reuse. Even after countless dips in liquid latex, the smooth, strong phenolic shows no sign of wear.

# MARBLETTE
# Phenolic Casting Resins
# S-T-R-E-T-C-H
# Your Production Dollars

**Woonsocket Rubber and Plastic Co.** is achieving mass production of hundreds of thousands of one-piece, form-fitting, ventilated latex girdles through the use of a Marblette liquid phenolic resin. Virtually unlimited quantities of exact pattern duplicates are cast to provide the many sturdy dipping forms that are needed to keep the production line moving efficiently.

This simple production improvement does not call for highly skilled or technically trained employees. You can easily test its applicability to latex dipping operations in your own plant.

Write, wire, or phone Marblette today for working samples of phenolic resin, along with production counsel at no cost or obligation.



Every detail of the original pattern is faithfully reproduced in the phenolic form shown here being removed from a steel-backed two-part vinyl mold after a short curing cycle. Speedy repetitions of the simple molding process result in as many Marblette dipping forms as mass production may require.

The Woonsocket girdle operation was described in detail in the April 1954 issue of *Rubber Age*. Use your company letterhead to request free reprints, along with Marblette's patented conversion computer which tells at a glance the kinds and amounts of casting resins and accelerators to use for producing any-sized part.

# Marblette

37-21 30th St., Long Island City 1, N. Y. Tel: STillwell 4-8100

CHICAGO • DETROIT • LOS ANGELES • WICHITA • HAVANA

**liquid phenolic resins** Casting resins for dies and tools • Heat and acid resistant resins • Bonding resins • Metal coating
Insulating varnish • Bristle setting cement • Laminating varnish • Wood coating • Plastic cements • Sealing resins • Resin foundry core binders

# For Rubber Compounding Use VELSICOL RESINS

## NOW AVAILABLE IN VARYING MELTING-POINT RANGES AND COLORED GRADES

**SOME SUGGESTED APPLICATIONS:**

- Mechanical Goods
- Electrical Insulation Compounds
- Rubber Shoe Soles and Heels
- Rubber Floor Tiling
- Gaskets and Jar Rings
- Rubber Adhesives and Cements
- Molded Rubber Products
- Tubular Compounds
- Reclaimed Rubber Sheeting
- Colored Rubber Stocks
- Battery Cases
- Hard Rubber Compounds

**FEATURES:**

1. THERMOPLASTIC HYDROCARBON RESINS.
2. COMPATIBLE WITH NATURAL AND SYNTHETIC RUBBERS.
3. EFFECTIVE PLASTICIZERS AND SOFTENERS . . . in highly-loaded clay stocks or in recipes incorporating carbon black.
4. MILL READILY.
5. EXCELLENT DISPERSING AGENTS FOR FILLERS AND PIGMENTS.
6. FACILITATE PROCESSING PROCEDURES . . . impart excellent milling, calendering processing and tubing characteristics to stocks.
7. IMPART EXCELLENT PERFORMANCE CHARACTERISTICS . . . such as good tensile strength, elongation and modulus, as well as good resistance to abrasion and aging.
8. POSSESS HIGH ELECTRICAL RESISTANCE PROPERTIES.
9. AID IN THE DEVELOPMENT OF NON-SCORCHY STOCKS . . . without excessive retardation of cure at high temperatures.

**For additional information concerning properties and applications of Velsicol Resins, WRITE:**

VELSICOL CORPORATION

General Offices and Laboratories
330 East Grand Avenue, Chicago 11, Illinois

Export Division
100 East 42nd Street, New York 17, New York

REPRESENTATIVES IN PRINCIPAL CITIES

PETROLEUM DERIVED CHEMICALS SERVING BASIC INDUSTRIES
VELSICOL

**STEADILY INCREASING SALES OF CABOT THERMAL CARBON BLACKS CERTIFY GROWING RUBBER INDUSTRY APPROVAL...**

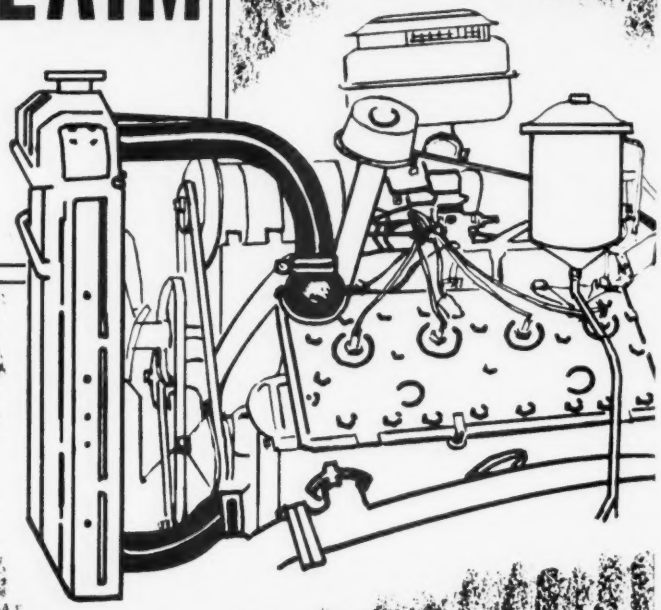
**Sterling® FT** (FINE THERMAL)
*for Natural Rubber Tubes*

**Sterling® MT** (MEDIUM THERMAL)

**Sterling® MT Non-Staining** (MEDIUM THERMAL NON-STAINING)
*for Mechanical and Extruded Goods*

CABOT GODFREY L. CABOT, INC. Boston 10, Mass.

# Pequanoc BUTYL RECLAIM #5950



- Fast Mixing
- Smooth Extruding
- Tight Cure

## FOR BUTYL RADIATOR HOSE

**FORMULA A-381-8**

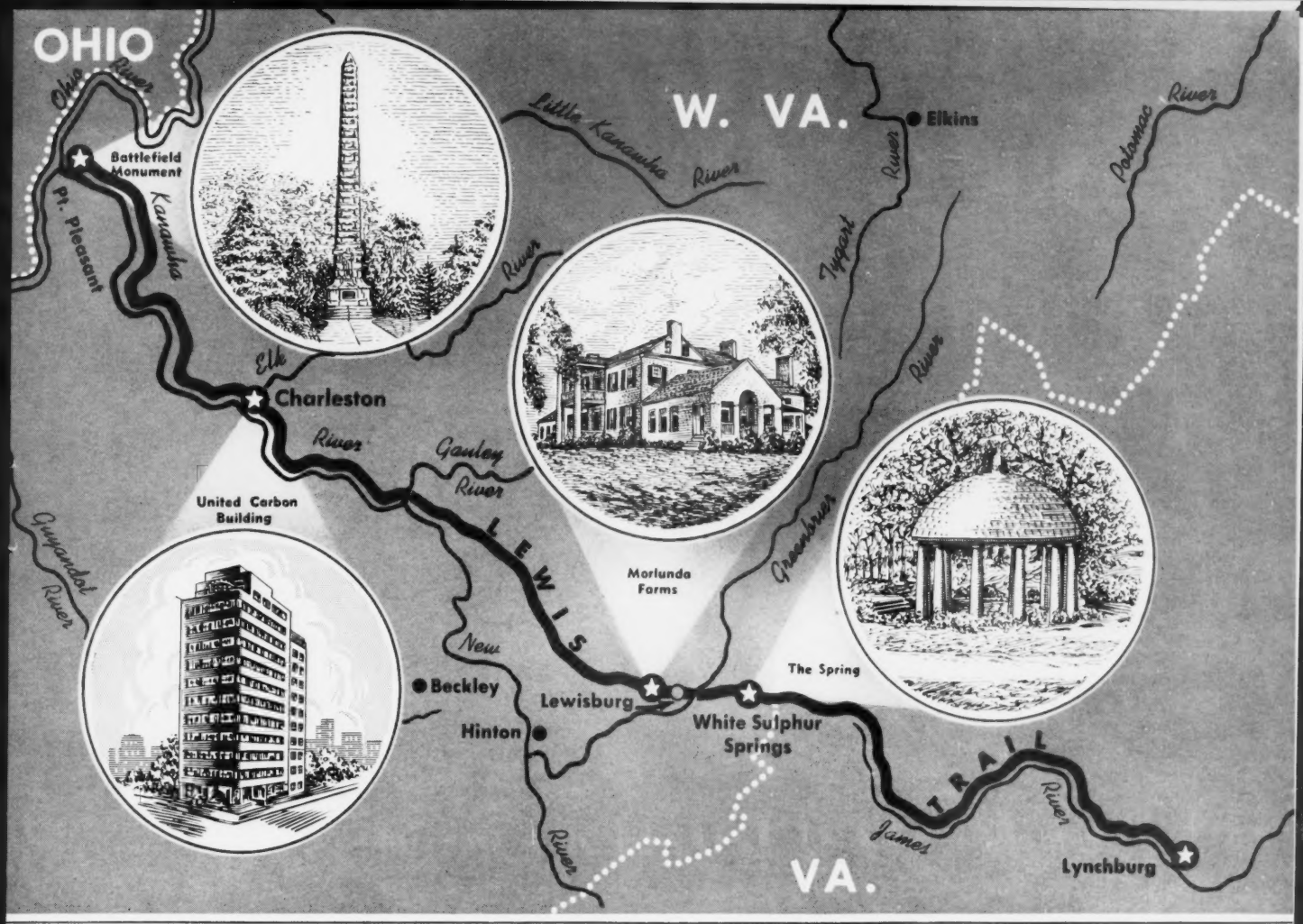
| | |
|---|---|
| PEQUANOC 5950 BUTYL RECLAIM | 51.00 |
| GRI 18 | 8.00 |
| FEF Black | 20.00 |
| Hard Clay | 11.20 |
| Zinc Oxide | 1.90 |
| Process Oil | 6.16 |
| Sulfur | 1.20 |
| Tetraethyl Thiuram Disulfide | .36 |
| Zenite or OXAF | .18 |
| | 100.00 |

| | |
|---|---|
| Press Cure | 30 Min. @ 287°F. |
| Tensile | 1050 p.s.i. |
| Elongation | 350% |
| Duro "A" | 70 |
| Est. Lb. Cost | .1080 |
| Specific Gravity | 1.32 |
| Vol. Cost | .1315 |

*Pequanoc Rubber Co.*

MANUFACTURERS OF RECLAIMED RUBBER

MAIN SALES OFFICE and FACTORY: BUTLER, N. J.




# The Lewis Trail

Though not as well known as the more famous trails, the Lewis Trail, which journeyed from Lynchburg to Point Pleasant, at the juncture of the Ohio and Kanawha rivers, passed through an area which was to become important to industries based on natural gas and oil. The trail became an important link connecting Virginia and the Ohio valley, brought people into what is now southern West Virginia and into the northwest territory.

Along this trail in those early days was a natural phenomenon, once owned by George Washington — Burning Springs. At this place, not far from present Charleston, escaping natural gas burned and was to the Indians a sight of awe and wonder. It was in this same area that the earliest settlers drilled for salt brines, often striking natural gas. In years of drilling, techniques were developed which later were used in the oil and gas fields.

Also along this trail the traveler passed by White Sulphur Springs and the beautiful farming area which now includes Morlunda Farms; the site of present Charleston and its tremendous chemical industry, and at the end of the trail, Point Pleasant, where the great Indian chief, Cornstalk, was defeated in 1774.

Carbon blacks came from this generalized area many years ago. The United Carbon Company, whose first plants were located not far distant, came into being in the area over which the settlers once trod.

From Charleston are directed the activities of United Carbon Company in the production of the best in carbon blacks.

**UNITED CARBON COMPANY, INC.**

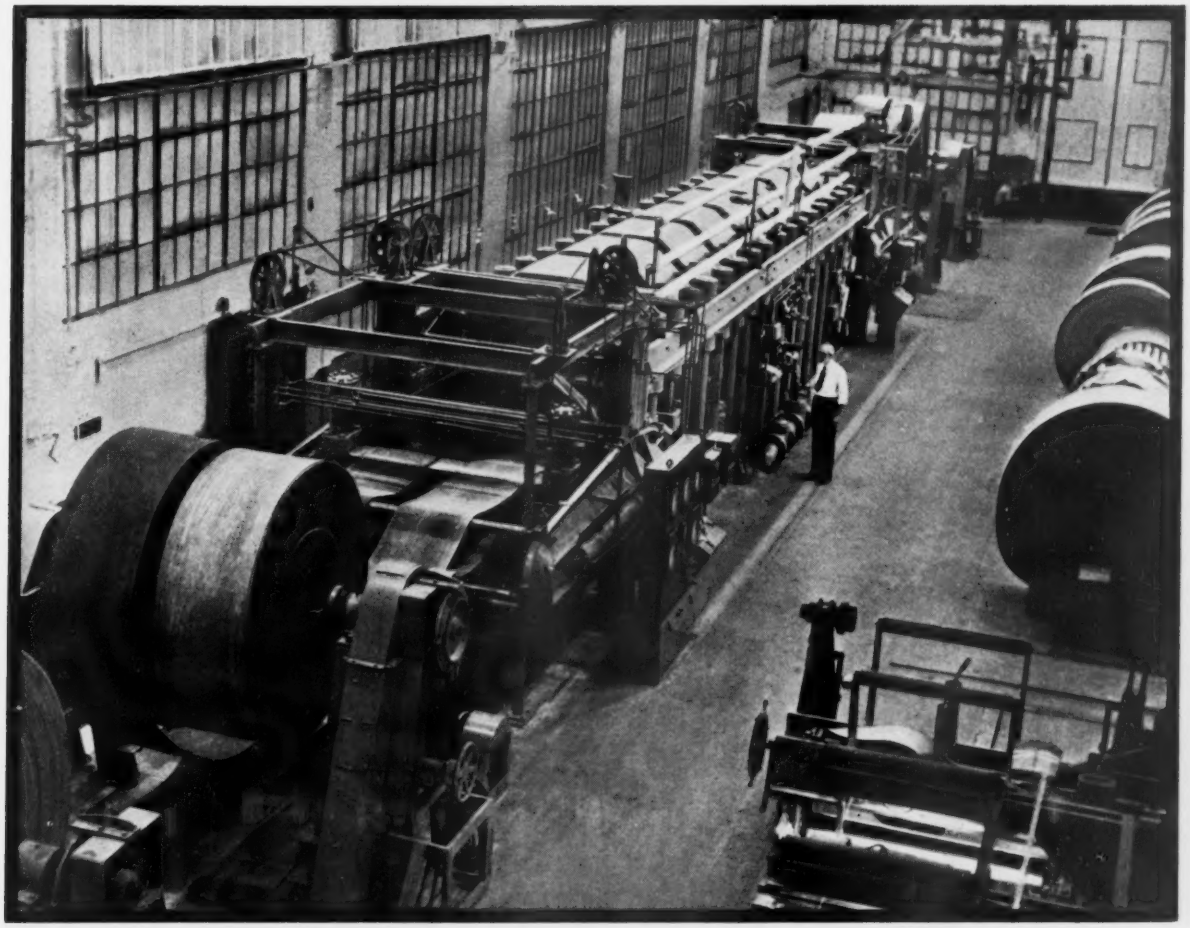
**Dixie 40,** our high modulus gas base furnace black (HMF), has a long-established record for uniformity, easy mixing, good tubing, freedom from scorch, and a balanced reinforcement that assures high resiliency, low hysteresis, and good resistance to tear and flex.

For quieter-riding tire treads use some **Dixie 40** — plus, of course, United's high reinforcing blacks.

**UNITED CARBON COMPANY, INC.**

**CHARLESTON 27, WEST VIRGINIA**

NEW YORK AKRON CHICAGO BOSTON MEMPHIS



# 500-TON ANSWER

## to industry's demand for larger conveyor belts

Installed in the Goodyear Tire & Rubber Company's plant at Akron, Ohio, is the world's largest capacity belt press. Designed and built by Farrel-Birmingham, it is capable of vulcanizing conveyor belts 72 inches wide, or one-third as wide as the standard two-lane highway.

The 70-foot long press weighs 500 tons, and requires two floor levels. It has two openings and the three platens are a special grade of cast Meehanite metal, 84 inches wide by 41 feet long. With 1500 pounds initial working pressure, the thirty-two 18-inch diameter rams give a pressure of 275 pounds per square inch on the platens.

This addition to Goodyear's flat-belt production capacity is a well-timed answer to the increasing demand for belts with greater pay-load capacity.

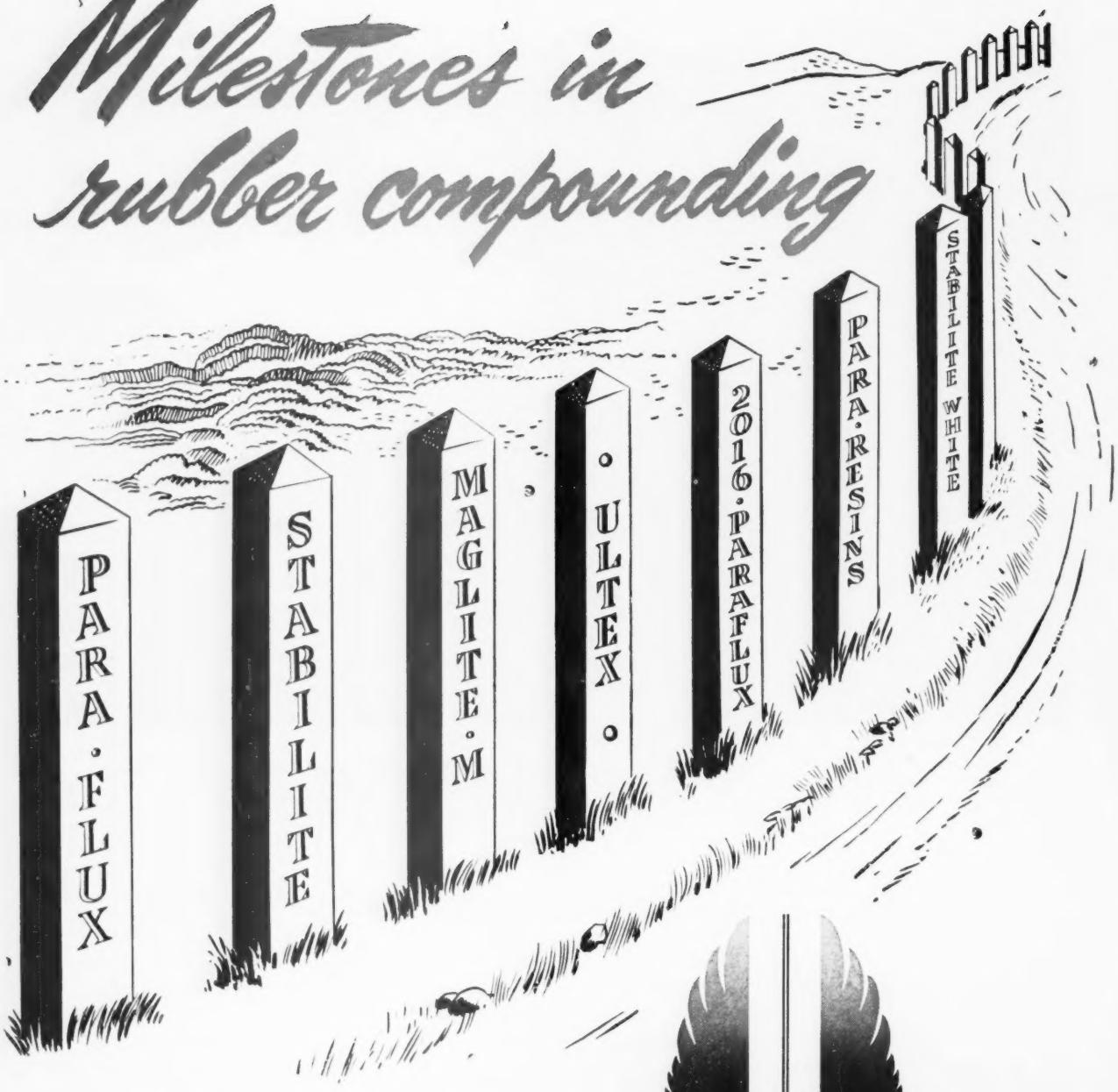
Farrel-Birmingham specializes in building these large presses for vulcanizing rubber belting. Smaller presses for molding rubber and plastics are made in a variety of types and sizes to suit specific requirements.

*Why not discuss your processing problems with a Farrel-Birmingham engineer? There is no obligation.*

Farrel-Birmingham®

**FARREL-BIRMINGHAM COMPANY, INC.**
ANSONIA, CONN.
*Plants:* Ansonia and Derby, Conn., Buffalo, N. Y.
*Sales Offices:* Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston
FB-920

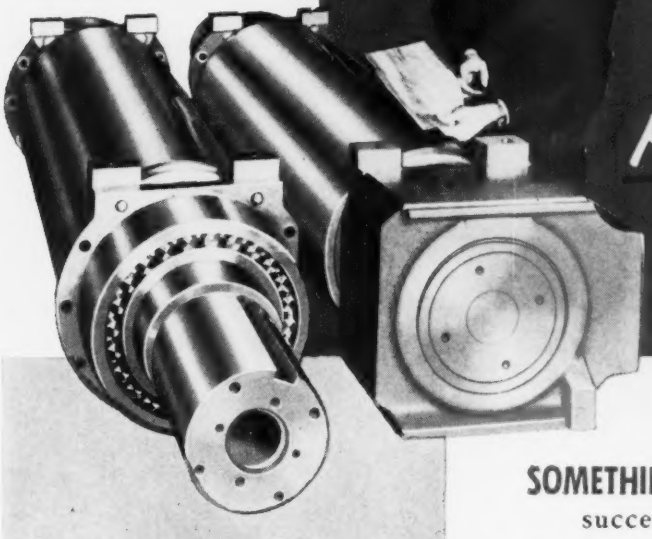
# Milestones in rubber compounding




*and many more to come....*

The C. P. Hall Co.
CHEMICAL MANUFACTURERS

Anti-Friction Mill Roll Bearings



# ADAMSON Roller-Bearing PLASTICS MILLS

**Fifteen years ago, it was realized by pioneer plastics manufacturers, that the problem of stock contamination and high temperatures must be solved. Recognizing these problems, this type mill was developed with the aid of the B. F. Goodrich Company and the SKF Bearing Company. Many improvements have been made by those contributing to the original design, but today, the basic design remains practically the same. *Every pound of Koroseal* material requiring the use of mills is processed on Adamson Roller-Bearing Mills.***

**Write us for complete mechanical and production data.**

**SOMETHING NEW?** NO! In continuous and successful operation since 1938.

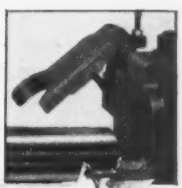
**WHERE?** IN ALL B. F. GOODRICH PLANTS where *Koroseal** material is processed.

**WHY?** Because of their ABSOLUTE CLEANLINESS . . . Freedom from Contamination . . . Low Maintenance where High Temperatures are Necessary.

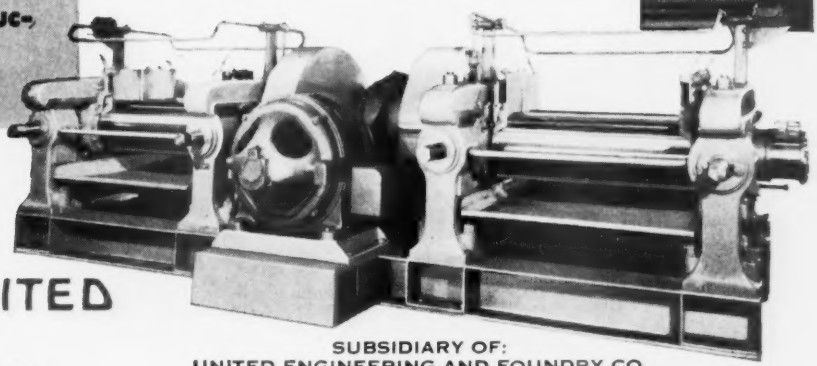
**HOW?** By use of SKF ROLLER BEARINGS WITH SPECIAL PISTON RING SEALS . . . Tilting Stock Guides . . . Removable Stainless Steel Stock Pans, and other Special ADAMSON Features.

*REGISTERED TRADE MARK OF B. F. GOODRICH COMPANY

Close-up of Swinging Stock Guide



22 x 60 Twin Mill Unit with Roller Bearings



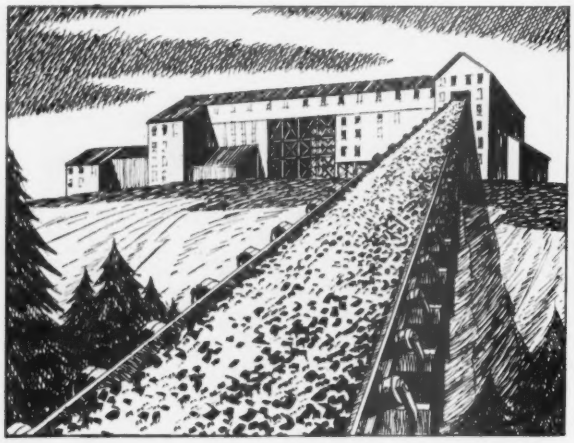
ADAMSON UNITED COMPANY

730 Carroll Street, Akron 4, Ohio

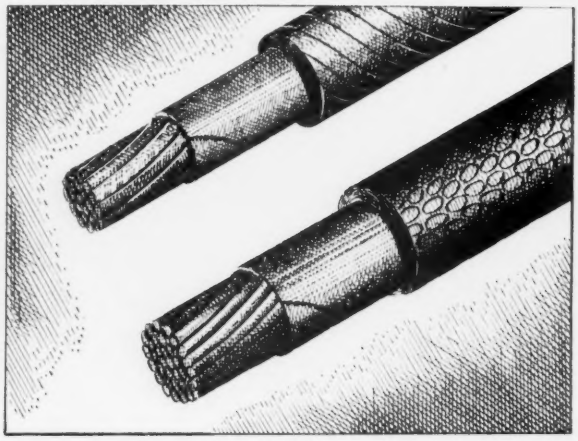
*SALES OFFICES IN PRINCIPAL CITIES*

SUBSIDIARY OF:
UNITED ENGINEERING AND FOUNDRY CO.

PLANTS AT:
PITTSBURGH • VANDERGRIFT • NEW CASTLE
YOUNGSTOWN • CANTON



For industrial conveyor and power transmission belts, Wellington Sears has a complete line of fabrics to insure long life and top performance.



"Columbus" sheeting is ideally suited for cable wrapping and other rubberized mechanical goods because of its constantly uniform quality.

## YOU GET VERSATILE FLEXIBILITY WITH WELLINGTON SEARS HOSE DUCK

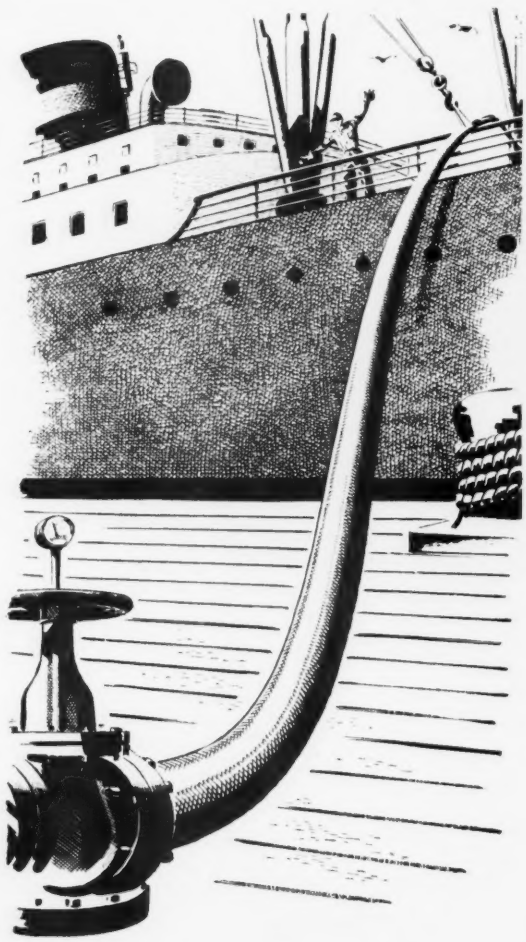
Service-proven in a wide variety of industrial hose applications, Shawmut Hose Duck is woven to lead a long and flexible life.

This Wellington Sears duck is a soft, strong, plied-yarn cotton fabric assuring flexibility and good impregnation. You'll find it available in many standard, as well as special, constructions for specific requirements.

With over 100 years' experience in industrial fabrics, Wellington Sears offers a complete line of cotton ducks for hoses of all types, belting and other mechanical rubber products . . . also fabrics utilizing the unique properties of high tenacity rayon, nylon and other fibers for rubberized specialties of many kinds.

If it's a rubber-and-fabric problem — talk it over with Wellington Sears.

*Write for your free copy of "Modern Textiles for Industry" which includes pertinent information on rubber applications. Address: Wellington Sears Co., Dept. L-4, 65 Worth St., N. Y. 13.*



**Superior Fabrics for the Rubber Industry**

| | |
|---|---|
| Belting duck | Airplane cloth |
| Hose duck | Balloon cloth |
| Enameling duck | Nylon, high tenacity |
| Army duck | rayon, other |
| Single and plied-yarn chafers | synthetics and |
| Sheeting | combinations. |

# Wellington Sears

A SUBSIDIARY OF WEST POINT MANUFACTURING COMPANY

***FIRST In Fabrics For Industry***

WELLINGTON SEARS COMPANY, 65 WORTH STREET, NEW YORK 13, N.Y.

Offices in: Atlanta • Boston • Chicago • Detroit • Los Angeles • New Orleans • Philadelphia • San Francisco • St. Louis

*A versatile, low-cost basic raw material*

# PICCOPALE

## *100% polymerized petroleum resins*

**PICCOPALE is a completely new and different type of synthetic resin, available in very large quantities (by the trainload, if you wish!) and at a price so low that it can be used as a basic raw material. Physical and chemical properties are given at the right, and representative applications below. Send for complete data and samples for study and experiment.**

## USED FOR A WIDE VARIETY OF PRODUCTS

**TEXTILES**—As a size for wool carpets and rugs . . . as a nonskid material . . . as a waterproofing for mats from fibres. Size for felted and nonwoven goods produced from textiles. Varnishes for insulating and coated fabrics. Wax mixtures and waterproofing for cordage and twine. Compounds for canvas and duck.

**WOOD PRODUCTS**—Priming and impregnating compositions for mill work. Special coatings for cooperage barrels, pails, kegs, tubs.

**PULP AND PAPER**—Size and binder for alkaline filled papers. Wax mixtures for coating and glazing paper. Binder for clays in coated paper. Laminating compound for built up boards. Stiffening agent for paperboard containers, boxes, cans, drums, tubes.

**CHEMICALS**—As a compounding aid for plastic materials and rubbers. Extender, carrier, and adhesive in the compounding of insecticides and fungicides. Additive for laminating and polish waxes. Maleic anhydride adducts.

**PROTECTIVE COATINGS**—Water based paints. Oleo resinous varnishes. Caulking compounds. Newspaper inks. Rust preventitive coatings.

**RUBBER**—As a softener in the manufacture of casings and inner tubes. Tackifier in solvent type rubber and latex type cements. Compounding aid in rubber footwear. Reclaiming agent in pale reclaim rubber. Hardening and dispersing aid in miscellaneous industrial and mechanical goods.

**LEATHER**—Compounding aid for packing and belting. Latex additive for waterproofing and impregnating innersoles. Ingredient in compounds for the stiffening and hardening of box toes, counters and soles.

**CERAMICS**—Resin ingredient in membrane concrete curing. Coating for glass fibers and mineral wool for insulating batts. Integral waterproofing for asbestos papers, gaskets, and insulation.

**METALS**—Ingot molds coating. Sealing compounds for cans. Potting and setting compounds for assemblies. Anti-rust coating for various metal forms. Drawing compounds.

**OTHER USES**—Ingredient in all-weather insulation, rubber covered wires and plastic covered wires. Tackifier in rubber-resin combinations for adhesive tapes and plasters. Resinous extender for fabricated plastic rods, tubes, and pipes. Compounding material for chewing gum base.

PICCO PICCO

### Properties of PICCOPALE

#### Physical

| | |
|---|---|
| Form | Thermoplastic Solid |
| Softening Point, Ball and Ring | 100 ± 3°C. |
| Specific Gravity at 25/25°C. | .970 — .975 |
| Pounds Per Gallon | 8.12 |
| Color: Gardner Scale | 13 Max. |
| Flash Point C.O.C. | 500°F. |
| Fire Point | 520°F. |
| Refractive Index at 20°C. | 1.528 |

#### Chemical

| | |
|---|---|
| Acid Number | Less than 1 |
| Saponification Number | Less than 2 |
| Ash | 0.2% Max. |
| Iodine Value (WIJS) | 120 |
| Iodine Value (Corrected for Substitution) | 30 |
| Bromine Number | 7.3 |
| Molecular Weight | 1100 |
| Double Bonds Per Mol. (Bromine Number) | 1 |

#### Grades Available

| Grade | Melting Point — Ball and Ring °C. | Form |
|---|---|---|
| Piccopale 100 | 100 ± 3°C. | Solid or Flaked |
| Piccopale 85 | 85 ± 3°C. | Solid |
| Piccopale 70 | 70 ± 3°C. | Solid |
| Piccopale 100 Sol. | | 80% Solids in Mineral Spirits |
| Piccopale Emulsion | | 50% Solids |

**PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.**
CLAIRTON, PENNSYLVANIA

*Plants at:* Clairton, Pa.; West Elizabeth, Pa.; and Chester, Pa.

*District Sales Offices*
New York, Chicago, Philadelphia, Pittsburgh
Distributed by HARWICK STANDARD CHEMICAL COMPANY, AKRON 5, OHIO

Pennsylvania Industrial Chemical Corp. (RA)
Clairton, Pennsylvania

Please send samples of PICCOPALE for (application):

_____

NAME _____ POSITION _____

COMPANY _____

ADDRESS _____

# *everything vinyl does...*
# *it does beautifully with*
# TITANOX®

This is beauty with a practical side. Hundreds of durable vinyl products, including upholstery materials, drapes, and shower curtains look their best when properly pigmented. And the best beauty treatment for vinyl is TITANOX white titanium dioxide pigments.

In vinyl, TITANOX rutile and anatase titanium dioxides impart exceptional whiteness, brightness and opacity, and their compatibility with all types of natural and synthetic polymers helps maintain natural strength. These modern pigments maintain bright, clean tints and their fine, uniform particle size means easy grinding and mixing for complete dispersion throughout the polymer.

Consult with our Technical Service Department for assistance with your problems in pigmenting natural or synthetic polymers. Titanium Pigment Corporation, 111 Broadway, New York 6, N.Y.; Atlanta 2; Boston 6; Chicago 3; Cleveland 15; Los Angeles 22; Philadelphia 3; Pittsburgh 12; Portland 9, Ore.; San Francisco 7.
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**®TITANOX**
*the brightest name in pigments*

**TITANIUM PIGMENT CORPORATION**
*Subsidiary of* NATIONAL LEAD COMPANY

2315

*the only rubber plant that can't use*

# NEVILLE CHEMICALS

For all the others Neville has a complete line of Coumarone-Indene Resins, as well as Petroleum Resins, Reclaiming Oils, Softeners, and Plasticizers.

Speaking of plants, our main one is located in the Industrial East with another in fast-growing Southern California. We are branching out too with warehouses in South Kearny, N.J., Philadelphia, Los Angeles, Montreal, Toronto, and Boston. So, whether you are on the main stem or not, Neville Products are near you.

NEVILLE

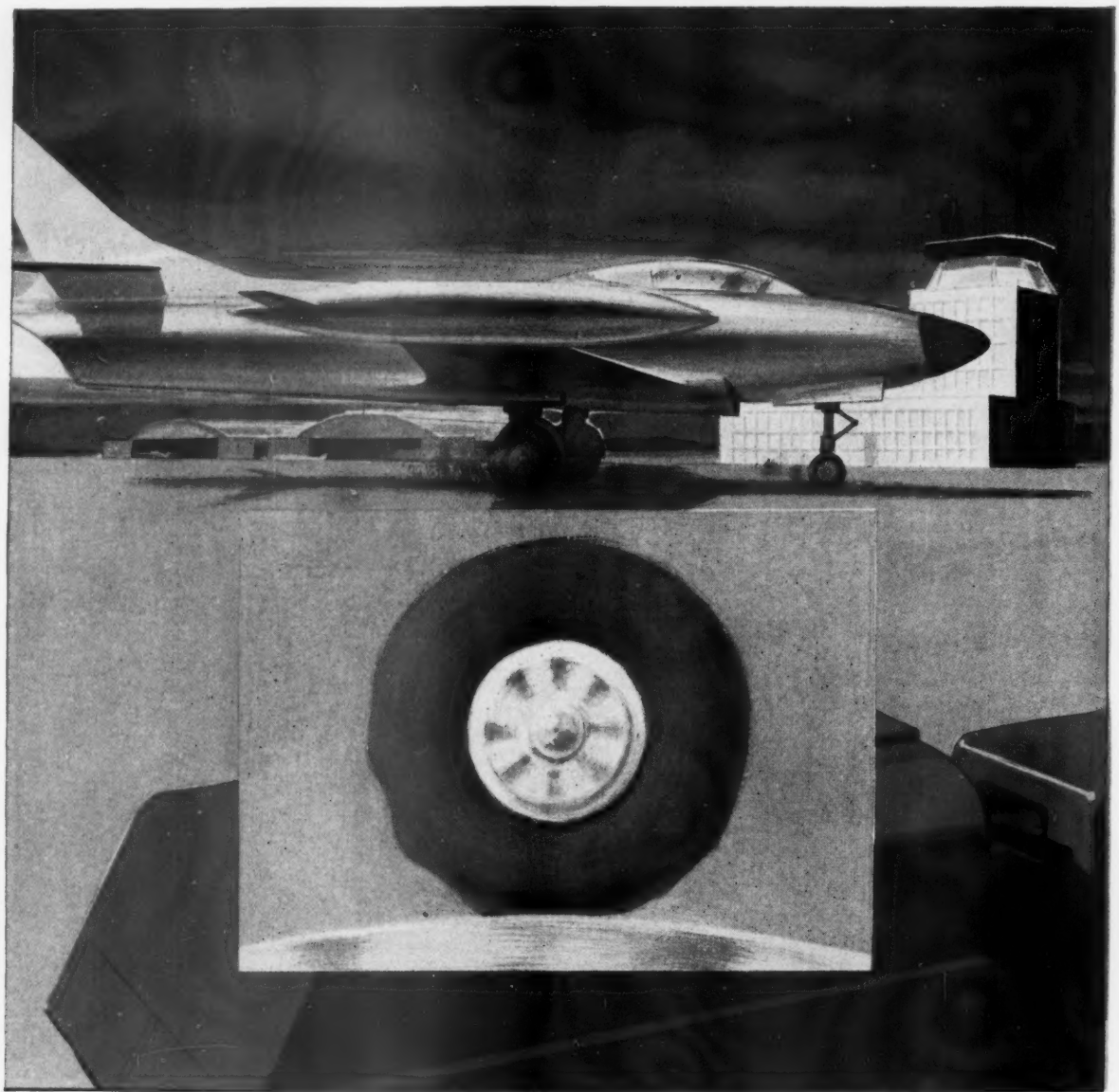
**NEVILLE CHEMICAL CO.**

**PITTSBURGH 25, PA.**

*Plants at Neville Island, Pa. and Anaheim, Cal.*

R-53

# GEN-TAC* Adhesion



**KURE-BLEND® MT MASTERBATCH.**
**50% TETRAMETHYL THIURAM DISULFIDE AND 50% GR-S TYPE RUBBER**

- Fast, easy mixing
- Excellent dispersion
- Dust-free
- Accurate weighing

**KO-BLEND® I. S. INSOLUBLE SULFUR.**
**50% CRYSTEX AND 50% GR-S TYPE RUBBER**

- Controls sulfur bloom
- Eliminates discoloration of light stocks
- Insures good dispersion
- Cuts milling time

# withstands this whirling torture

A jet plane tire develops these distorting traction waves when tested at 250 miles per hour. The adhesion of the rubber to the Nylon carcass plies must resist the tremendous deformation and centrifugal forces which tend to tear the tire apart at high speeds.

Gen-Tac Latex provides adhesion as great as the strength of the Nylon itself and makes it possible to produce tires that will absorb this terrific whirling punishment.

This same bonding strength has also proven itself over and over in actual field conditions in the better passenger and truck tires, V-belts, conveyor and transmission belting, hose and proofed goods made from either Rayon or Nylon. Wherever adhesion is vital to safety and performance you can turn to Gen-Tac—the proven bonding latex.

For further information on Gen-Tac or other General Tire Chemical products just fill out the coupon below.

*T. M. G T & R Co.

*Creating Progress Through Chemistry*

Chemical Division
GENERAL
THE GENERAL TIRE & RUBBER CO.

GEN-TAC

The General Tire & Rubber Company, Chemical Div.,
1708 Englewood Ave., Akron 9, Ohio

Send literature on ☐ Gen-Tac
☐ Ko-Blend ☐ Kure-Blend

☐ Have your representative contact us

NAME _____

COMPANY _____

STREET _____

CITY _____

STATE _____

RA-6-54

# The wrong solvents cause trouble, too!

**Skellysolve for Rubber and Related Industries**

**Applications**

**SKELLYSOLVE-B.** For making quick-setting cements for the shoe, tape, container, tire and other industries. Quick-drying, with no foreign taste or odor in dried compound.

**SKELLYSOLVE-C.** For making quick-setting cements with a somewhat slower drying rate than those compounded with Skellysolve-B.

**SKELLYSOLVE-D.** For cements and variety of manufacturing operations. Good odor. Quick drying. Minimum of heavy, greasy compounds.

**SKELLYSOLVE-H.** For general use in manufacturing operations and cements, where faster evaporation rate than that of Skellysolve-D is desired.

**SKELLYSOLVE-E.** For use wherever a relatively slow drying solvent is desired.

**SKELLYSOLVE-R.** For general use in tire building and a variety of other manufacturing operations and cements. Reduces evaporation losses. Medium quick final dry. Lessens bloating and skinning tendency.

**"Doc" MacGEE says:** The water that Junior pours into Dad's gasoline tank is nothing compared to the Cain that can be raised by the wrong solvents in your manufacturing processes. Guard your plant against such expensive possibilities by putting your solvent requirements in the hands of the solvent pioneers and specialists—the men of Skellysolve!

**You can count** on the quality of Skellysolve—batch after batch its uniformity is always "right on the button." The reason: more than 24 years of specializing in solvents, and the strictest of quality controls.

**Strictly what you want,** too, are Skellysolve's solvent properties. Check for low end points, quick evaporation, reduced blushing tendency, low vapor pressure, a minimum of unsaturates and pyrogenic decomposition products plus a minimum of low and high boiling compounds. You'll find Skellysolve has it!

**Skellysolve** has what you want, also, for controlled vapor pressure—your assurance against bloated containers. And especially vital to rubber cement manufacturers, Skellysolve's minimum of low boiling compounds assures freedom from "seeds," while its minimum of greasy residues means superior bonding strength.

**Write now** for more complete technical facts about Skellysolve.

SKELLY

**Skellysolve**

INDUSTRIAL DIVISION, SKELLY OIL COMPANY
KANSAS CITY, MISSOURI

GUSSETT

# VULCANIZERS

**WITH**

## GUSSETT EASY GLIDE QUICK OPENING DOORS

## *Cost Less to Own ...Less to Operate*

**Safe, Fast, Easy Door Operation**

**Note use of heavy lubricated bronze bushings at all wearing points and thrust bearing to support weight of door.**

The Gussett Easy-Glide Quick-Opening Door is the result of almost forty years of practical experience in designing and building processing equipment for the rubber industry.

Fabricated of heavy steel plate, it offers high strength and a higher factor of safety without excessive weight. Precision machining insures accurate seating and freedom from leakage.

The large-diameter hinge pin and door center pin turn in heavy, pressure-lubricated bronze bushings and the weight of the door is supported by heavy-duty roller thrust bearings to minimize time and effort required to open and close the door and insure long, trouble-free service. Hundreds of Gussett Easy-Glide doors are in use all over the world.

Easy-Glide Doors are furnished without extra cost (often at important savings) on all Gussett-built Vulcanizers . . . horizontal or vertical . . . 18 inches and larger . . . any desired length . . . for any working pressure up to 600 pounds.

*WRITE OR WIRE FOR BULLETIN*

## GUSSETT BOILER & WELDING, INC.

**1545 Whipple Road S. W. • Canton 10, Ohio**

# HYDROCARBON PANAREZ RESINS

## 3-210 AND 6-210 OUTSTANDING RUBBER COMPOUNDING RESINS

**PROPERTIES**
- Low Specific Gravity
- Low Odor
- Uniform Quality
- Improves Processing
- No Effect on Cure
- Light Color

**FOR**
- Better Flex Life
- Improved Abrasion Resistance
- Maximum Extrusion Rate
- Improved Ozone Resistance
- Excellent Electrical Characteristics

**EXCELLENT COMPATIBILITY with**
- Natural Rubbers
- General Purpose GRS
- Cold Rubber GRS
- Buna N Type Rubbers
- Butyl Rubber

| PANAREZ | Specfiic Gravity | Color Barrett | Softening Point, °F |
|---|---|---|---|
| 3-210 | 1.049 | 1 | 200-220 |
| 6-210 | 1.106 | 2 | 200-220 |

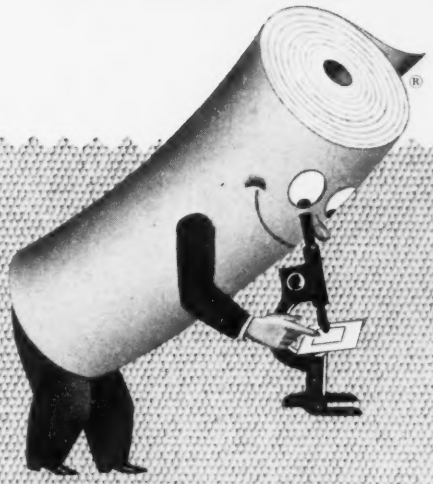
*Flaked or Solid — Prompt Delivery — Unlimited Quantity*

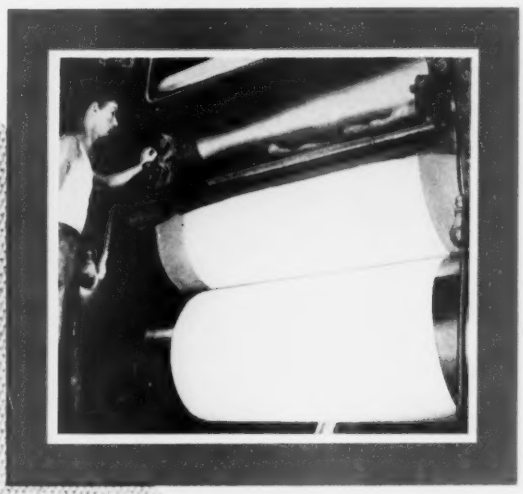
**BEST — AND LOWEST COST, TOO!**

PAN AMERICAN CHEMICALS

PAN AMERICAN *Chemicals*
DIVISION
*Pan American Refining Corp.*
122 EAST 42ND STREET · NEW YORK 17, N Y

# UNIFORMITY Makes The Big Difference In INDUSTRIAL FABRICS





# MT. VERNON FABRICS

## Give You Greater Uniformity

Checking evenness of roving with Belger Tester. One of a series of comprehensive laboratory controls throughout production to assure uniformity in all Mt. Vernon-Woodberry products.

**FABRICS ENGINEERED TO FIT YOUR NEEDS**

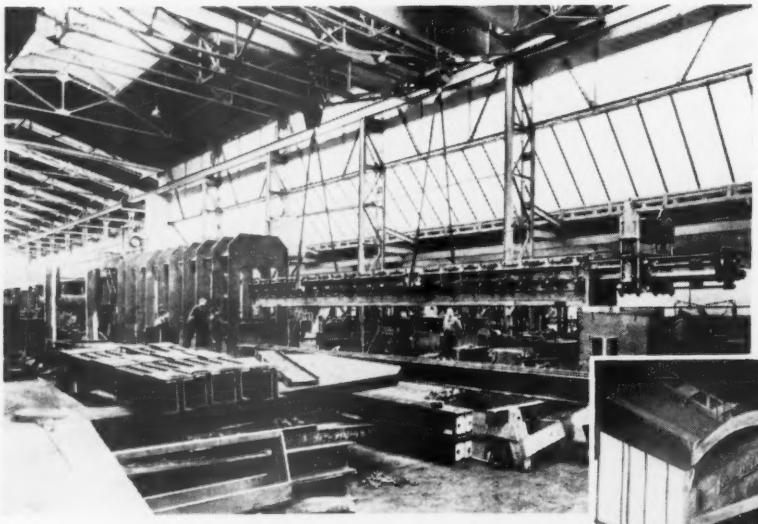
Need adaptation of an existing fabric to your special purposes? Or creation of an entirely NEW fabric – cotton, synthetic or blend – to meet your specifications? Mt. Vernon-Woodberry's staff of textile engineers is available on request to help you with your problems in development or application of industrial fabrics.

*Mt. Vernon-Woodberry Mills*

Main Office: 40 Worth St., New York
Branch Offices: Chicago • Atlanta
Baltimore • Boston • Los Angeles

TURNER HALSEY COMPANY
*Selling Agents*

# Siempelkamp



Assembling
Belt Press

One of the many
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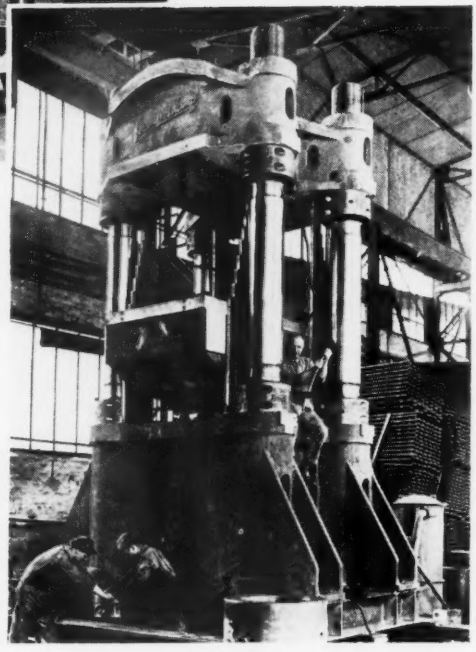
built to specifications



**Siempelkamp builds Hydraulic Presses of all types to specifications. Established in 1883 Siempelkamp has acquired the "know how" to make the finest in machinery at the lowest cost.**

Write today for quotations F.O.B. New York City. Direct credit arrangement to well-rated companies.

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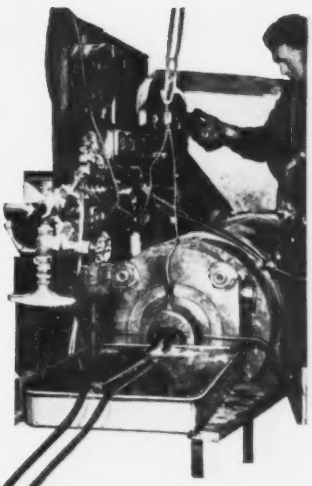
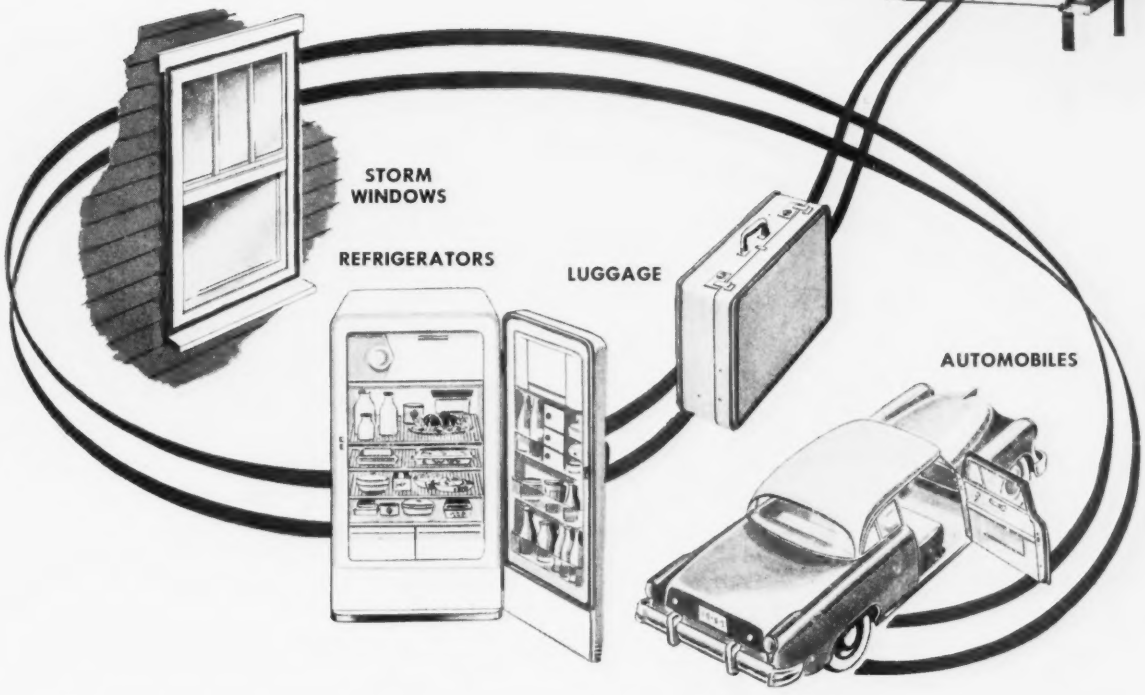
# Pittsburgh PX Plasticizers add *Versatility* to your *Vinyl* EXTRUSIONS






WHERE you work, where you live, where you travel . . . you see more and more vinyl extruded products in use every day. Their exceptional ability to conform in shape, size and color to end product use is just one reason for their rapidly growing popularity. In addition, they offer unusual resistance to chemicals and aging, excellent shape retention and easy workability.

Formulating—and retaining—these desirable properties in vinyl plastic extrusions calls for the use of plasticizers with outstanding permanence and flexibility characteristics. To achieve these qualities, the Auburn Button Works, Inc., Auburn, New York, uses Pittsburgh PX Plasticizers in its extruded products and in many other high quality vinyl products. From experience, Auburn knows the benefits of buying from a basic producer. *And Pittsburgh is basic.*

We quality-control every step of plasticizer production from coal to finished plasticizer. *You* benefit by the assurance of top uniform quality in every drum, tank truck or tank car shipment. If you'd like to enjoy benefits like these, call one of our representatives in Pittsburgh, New York, Cleveland or Los Angeles. He'll welcome the opportunity to discuss your problems and make money-saving recommendations.

W&D 5136

Please call on us at Booth 238 and 242 at the 6th National Plastics Exposition, June 7-10 in Cleveland

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# POLYBUTENES

## An important raw material in a variety of mechanical rubber products

**Since 1935, when Oronite Polybutene was first produced and sold, these important raw materials have become widely used in a variety of rubber products. Their light color makes them specially acceptable for compounding light-colored molded rubber goods.**

**PROPERTIES:** Oronite Polybutenes are clear, light in color, tacky, chemically inert liquids. They will not become gummy or waxy, do not harden, darken or change in any essential property over long periods of atmospheric exposure. Oronite Polybutenes can readily be emulsified using standard techniques and equipment. In the emulsified form or in their natural form, they are useful as tackifiers, plasticizers or extenders for natural or synthetic rubber products. Available in a number of high viscosity ranges to meet your requirements. Write or call any Oronite office for Polybutenes technical bulletin.

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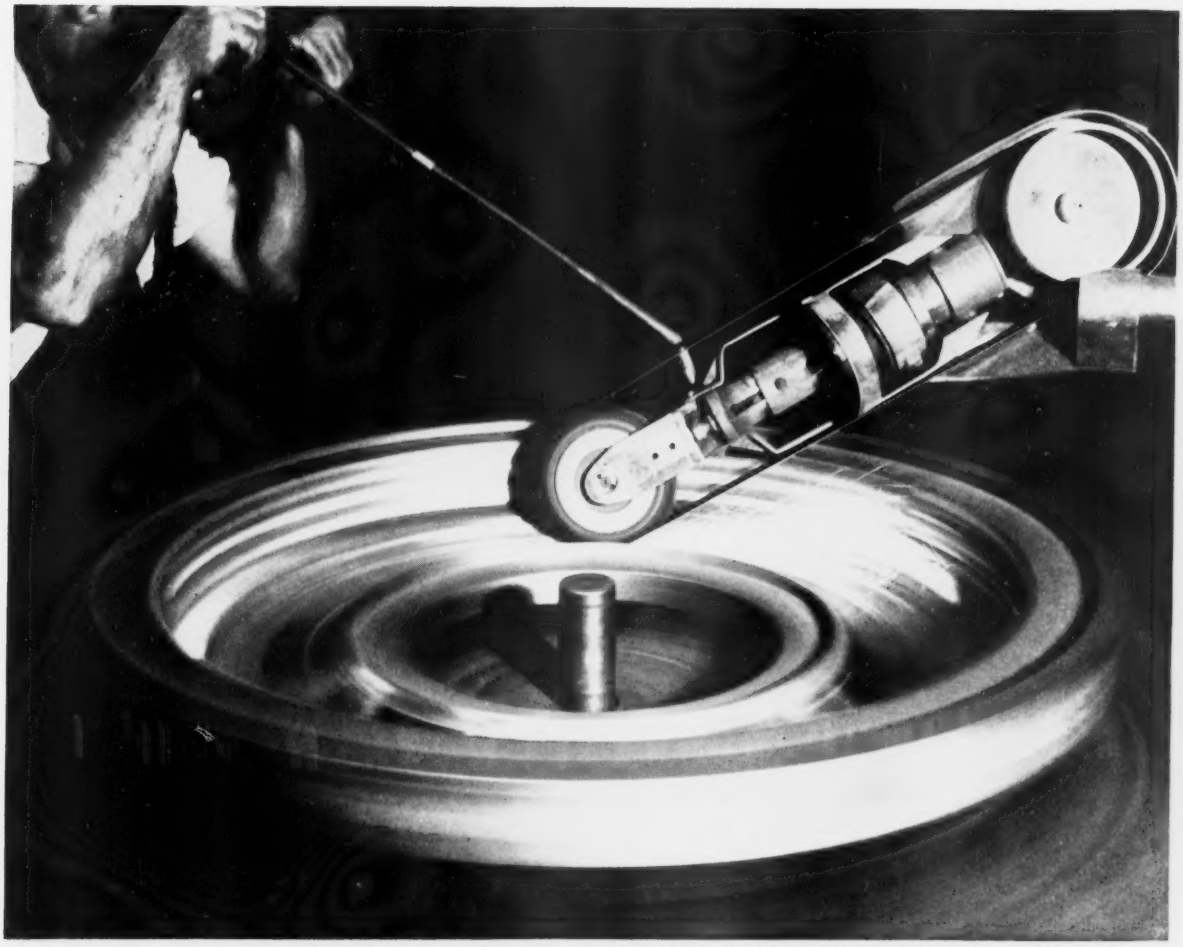


# *Why tire molds are "finished" twice* at BRIDGWATER

Here a tire mold craftsman pre-polishes a mold cavity, at Bridgwater's Athens Machine Division, Athens, Ohio. This is a "first finish" operation, performed on all Bridgwater Tire Molds after cavities are machined and before top cutting on the tread engraving machines. A second and "final finish" manufacturing phase occurs at the *end* of our mold production line, but two important purposes are served by this "first finish" operation: One, if even a *minute* flaw exists in the cavity surface, it is revealed for correction. Two, pre-polishing helps obtain critical fitting between cavity surface and template, assuring perfect adherence of form to mold design.

"First finishing" typifies the infinite care with which automotive tire molds are made at the Athens Machine Division. It is one example of the *many* precise skills and specialized machine tools — many of our own design — which combine to produce the Bridgwater Molds well known in the tire industry for their higher quality and greater workability.

Yet you pay no premium for Bridgwater Tire Molds . . . At Athens, tire molds are our only product. Here, extremely efficient machines and production methods, and experience-developed skills of metalworking craftsmen, are devoted exclusively to meeting tire industry mold requirements *quickly*, at favorable cost.

Athens Machine Division

BRIDGWATER MACHINE COMPANY

Akron, Ohio

1907

# Cyanamid Research Aids Rubber Progress

Cyanamid's many years of research in rubber chemicals has resulted in the production of several products of major significance to the rubber industry.

**BASIC RESEARCH** in chemicals to facilitate rubber processing and to impart special properties to rubber products is conducted at Cyanamid's Stamford Research Laboratory, Stamford, Conn.

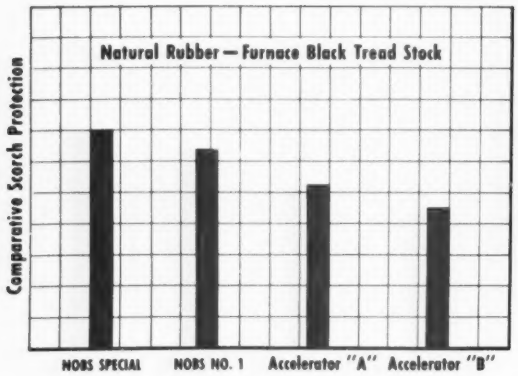
**PRODUCTION RESEARCH** on chemicals originating at Stamford is pursued by chemists skilled in all phases of rubber chemicals production, at Cyanamid's plant, Bound Brook, New Jersey.

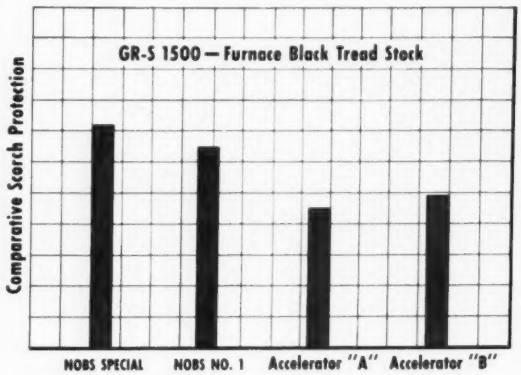
# And Now... the Two Latest Milestones

**NOBS* No. 1 ACCELERATOR** . . . for outstanding delayed action. It is designed primarily for use with reinforcing (high pH) furnace blacks in natural rubber and GR-S.

**NOBS* SPECIAL ACCELERATOR** . . . developed for use where special protection from scorching is essential.

*Trade-mark



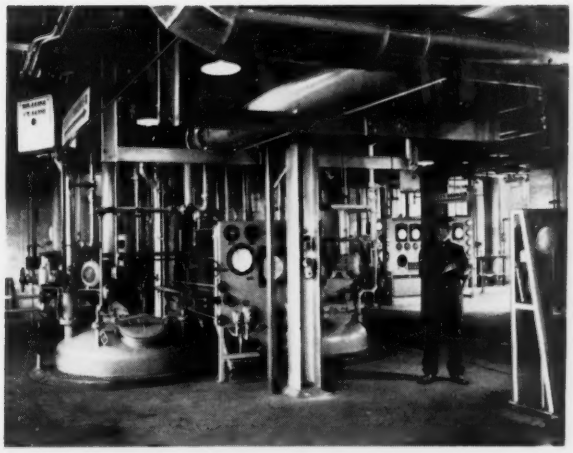



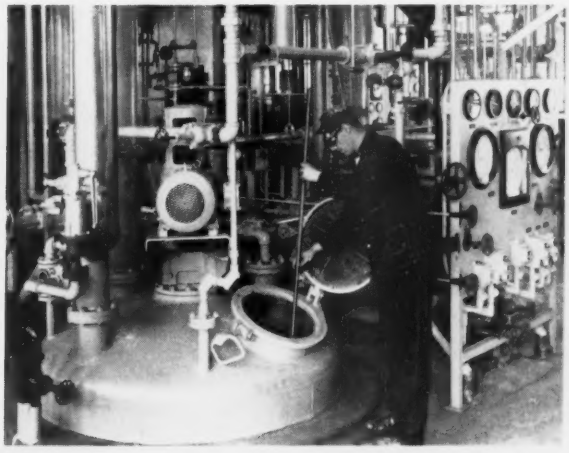
# Product Superiority has Caused Great Demand

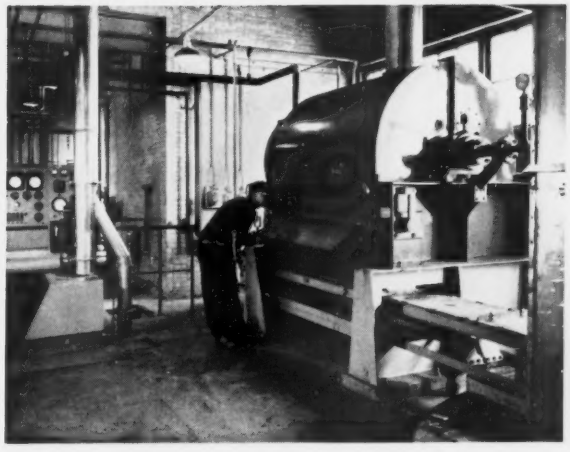
## and to Meet This Demand...A New, Modern Plant

Shortly after their introduction to the rubber industry, NOBS No. 1 and NOBS SPECIAL were in such great demand that Cyanamid's already large production facilities rapidly became inadequate. Therefore, to insure ready availability of these two great accelerators to meet every demand, a new, modern plant is going into production at Bound Brook. This plant is designed and equipped exclusively for the production of NOBS No. 1 and NOBS SPECIAL.

**Interior views of the new NOBS plant at Bound Brook, N. J., showing autoclaves, instrumentation and flaker.**







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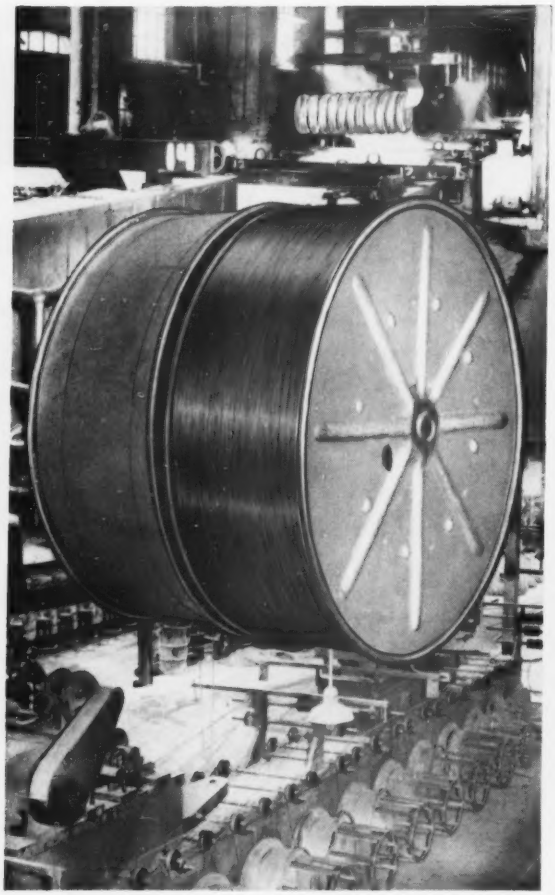

***Inflation: a cockeyed economic condition that makes the prices you get look good and the prices you pay look awful.***

Inflation has affected the wire making business just as it has all other industries. But the upsurge in the cost of raw material, handling, labor and everything else along the line has been to us a challenge. Here at Johnson, through improved manufacturing, we have been able to meet inflation part way, with the result that Johnson High Carbon Wire, has advanced in price less than many other commodities that have zoomed since jet planes passed speed of sound, approached speed of gossip.

JOHNSON special bronze plated wire — standard for tire manufacturers and for vacuum and defroster hose producers. Advantages — uniformly clean finish . . . maximum adhesion to rubber . . . higher elongation . . . extra fatigue properties.

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**REFINERS**
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**PRESSES**
*compression*
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***EEMCO a leader in RUBBER and PLASTICS MACHINERY***

If you are looking for answers to your rubber and plastics equipment problems, you will find them at EEMCO. Yes, they offer smoother sailing on many production problems with the machines which bear the EEMCO trademark. Skillfully designed by qualified engineers—and made by workmen with many years of experience—they offer the utmost in quality, design and workmanship. Serving manufacturers throughout the world, EEMCO rubber and plastics processing machines have proved their worth. EEMCO has its own Foundry, Machine Shop, and Engineering Department to insure fast delivery. Get prices and delivery dates from EEMCO where only the best has been built for many years.

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For good whiteness . . . or true blues
in rubber or plastic tile
specify American Cyanamid's

# ULTRAMARINE BLUE

Permanent and highly resistant to alkalis and soaps

For toned whites or full rich shades of blue, the Cyanamid Ultramarines offer a wide choice of color tone.

You can obtain pleasing whiteness with UNITANE® 0-220 or UNITANE® OR-350 titanium dioxide toned with Ultramarine Blue 59-1824.

Cyanamid's Ultramarine Blues provide high color purity. These popular pigments are formulated to cover a wide range of shade, clarity, and strength to give maximum versatility in compounding.

Make your selection of Ultramarine Blues according to the properties listed in the table – or call in your Cyanamid Pigments representative for complete information.

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|---|---|
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| Ultramarine Blue 59-3584 | Intermediate (Med. Red) |
| Ultramarine Blue 59-5604 | Intermediate (Med. Red) |
| Ultramarine Blue 59-6204 | Greenest |

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For SOLKA-FLOC gives better results in your finished product—reduced blistering and nerve... controlled shrinkage... high dimensional stability... sharper designs ... harder, smoother surfaces.

A finely-divided wood cellulose, SOLKA-FLOC will quickly solve your dispersion problems. Find out what it can do for you—to step-up-production, improve your products, increase your profits. Send your processing problems to our Technical Service, Dept. GF-6, Boston office.

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# 1 of 42 operations

# eliminating the guesswork from Banbury* rotor repair

The body, journals and gear fits of this Banbury rotor have been built up to full original dimensions, machined and ground. The body is now being gauged for size—one of the forty-two separate operations, including three nondestructive tests for soundness, performed on all rotors rebuilt by Farrel-Birmingham.

Soon going back into service—as "good as new"—the future of this rotor did not always look so bright. It was returned to us with severe pits, the shaft out of alignment, and the bearing surfaces badly scored. As any corrective machining would have made the rotor undersize, both body and necks first had to be built up to the proper dimensions.

There is no guesswork in determining these dimensions. They are found in the exclusive blueprints used in making the Banbury originally.

There is also no substitute for the experience and facilities of Farrel-Birmingham. No other company has the blueprints, jigs, fixtures and gauges to which new machines are built and which are necessary for satisfactory repairs. Service is further facilitated by the largest stock of standard parts and complete Banbury bodies in existence.

For the most thorough Banbury rebuilding, write, wire or telephone one of the offices listed below.

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**AKRON, OHIO,** 2710 First National Tower (PArtage 2-8871)
**CHICAGO, ILLINOIS,** 120 So. LaSalle St. (ANdover 3-6434)
**LOS ANGELES, CALIF.,** 2032 Santa Fe Ave. (Lafayette 3017)
**HOUSTON, TEXAS,** 860A M & M Building (Capital 6242)

*Farrel-Birmingham®*

*Trade-mark

FB-914

# Only the BOSS of the

## should read this message . . .

## *and he should read it only if his profit picture is bothering him*

"Would modernization of our processes or layout pay off?"
"Can my scrap loss be reduced?"
"Does the quality of some of my products need a boost?"
"Are our conversion costs in line?"
"What new methods are available which would improve our costs?"

If you boss a company which manufactures tires, mechanical goods, hose or other products from rubber or plastics, you recognize these questions and ideas. You are bombarded with them all the time.

Wouldn't you like to have in your hands, an authoritative guide embracing such items as: Analysis of cost factors in actual operations; physical changes which would permit reduction of costs; specific equipment recommendations; a layout of your plant as it is today; a comparison to show what changes could be made to improve your costs and profits and a projection of new costs which justify the proposed capital expenditures.

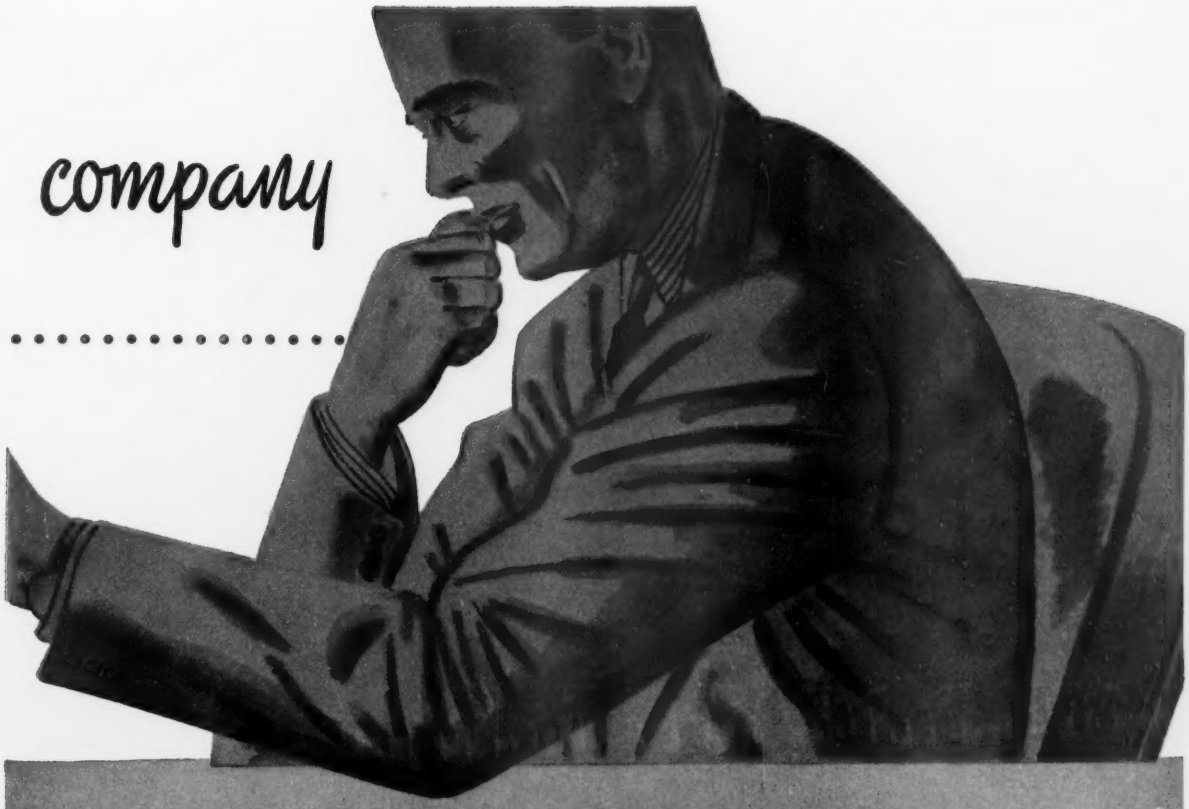
Perhaps you have found yourself many times in the position of having to make

## one study (and survey report)

## Many companies

1. Proposed ultimate production schedule.
2. Plant layout—present and future.
3. Description of proposed processes including direct and indirect labor requirements.
4. Detailed description and cost of plant modifications and new equipment.
5. Projected manufacturing costs based on modernized plant and processes.
6. Appendix of supporting data.

company



decisions on capital expenditures with questionable justification for the proposals. Competent consultants are available to study sales, physical facilities, cost accounting and other special phases of your business. But, haven't you at times needed an experienced group to make the most important study of all—the actual physical operation of your plant in relationship to costs and profits.

In these days of tough competition more and more industries are turning to automation to minimize conversion and material costs. A consultant group thoroughly experienced in the engineering and operating phases of the rubber and plastics industry can be of invaluable help in applying the principles of automation to accomplish cost reduction in your plant.

**at modest cost can lead to increased profits**

*have proved this point*

This service has paid off for several companies. Recent studies by our group include: a heel and sole plant; a toy company; a mechanical goods plant; a plastic plant; and a few tire companies. In some cases the report has pointed out savings that could be made through simple changes in procedure (without capital expenditure) that more than paid for the cost of the report.

Remember this—the study will be invaluable to you as a manager, whether you actually make any capital expenditures or not. You will have a blueprint for future growth and modernization. That alone will help you make many sound decisions.

*What's needed?*

A preliminary talk will cost nothing. A representative of Hale and Kullgren will be happy to visit your office at your convenience.

CONSULTANTS FOR RUBBER AND PLASTICS

HALE AND KULLGREN INCORPORATED

associated with The Aetna-Standard Engineering Co.
MACHINERY BUILDERS

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**MAKE IT COUNT!**

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Dependable • Uniform • Highest Quality

Newly reduced prices of Sebacates now make it possible to incorporate their well known superlative features into your product.

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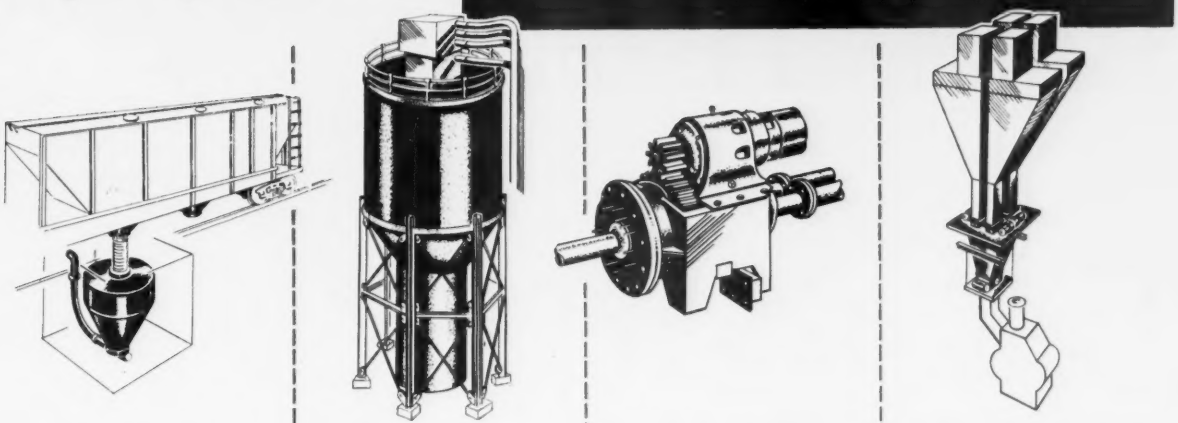
## ...don't leave this out of your plans...

## KENNEDY
### AUTOMATIC PNEUMATIC CARBON BLACK SYSTEM



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# AUTOMATICALLY!

Follow the rubber industry trend toward automatic Banbury operation. Now made possible by today's automatic material handling equipment and control systems.

The Kennedy Automatic Pneumatic Carbon Black System has played a major role in the successful attainment of automatic Banbury operation.

This thoroughly proven, completely dependable system unloads bulk cars, stores, distributes and weighs out carbon black, with advantages not obtainable with any other method.

***SIMPLE.*** Basic equipment has no high speed moving parts to wear and require replacement. Blacks are conveyed through standard pipe transport lines which require no space-wasting structures.

***AUTOMATIC.*** A central electrical control unit operates the system without attention to meet any production demands. Several blacks can be handled without contamination through same transport line.

***FLEXIBLE.*** Any capacity—any number of blacks—any number of Banburys. Future expansion of system at minimum cost and least disturbance to existing plant.

***CLEAN.*** System is completely enclosed from bulk car to Banbury. Vastly increases plant cleanliness—makes "good housekeeping" easier.

**If you are contemplating a modernization program for one or more of your Banburys — learn the facts about the Kennedy fully automatic Pneumatic Carbon Black System.**

## KENNEDY-VAN SAUN
### MANUFACTURING & ENGINEERING CORPORATION
TWO PARK AVENUE, NEW YORK
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## Now Readily Available in Bulk

This outstanding phthalate mixed ester plasticizer (iso-octyl iso-decyl phthalate), combines the excellent all-around performance of the usual phthalate esters with the following extras:

1. **Low Volatility!**
2. **Superior Water Resistance!**
3. **Improved Heat Stability!**

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**Film and Sheeting**
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**Electrical Extrusions**
**Fabric Coatings**
**Natural and Synthetic Rubbers**
**Molded Articles**

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DOA (Di-2 Ethylhexyl Adipate)
DOS (Di-2 Ethylhexyl Sebacate)
E-S (An Epoxidized Trieste.)
TG-9 (Triethylene Glycol Dipelargonate)
O-16 (Iso-Octyl Palmitate)
DIOA (Di-Iso-Octyl Adipate)
DIOS (Di-Iso-Octyl Sebacate)
DBP (Dibutyl Phthalate)

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*For highest quality*

**HAF-SAF BLACKS**

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NEW

*the complete facilities of its*

**PONCA CITY, Oklahoma, plant –**

**– observing the strictest quality control to meet the high standards and growing demands of the rubber industry.**

For complete line of Witco-Continental Carbon Blacks

# *Witco-Continental* CARBON BLACKS

Recognized *for over twenty-five years* as dependable Carbon Blacks for rubber products of superior quality.

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**Continental® AA**—Easy Processing (EPC)—Witco No. 12
**Continental A**—Medium Processing (MPC)—Witco No. 1
**Continental F**—Hard Processing (HPC)—Witco No. 6
**Continental R-40**—Conducting (CC)

## Furnace Blacks

**Continex® SRF**—Natural Gas Type, Semi-Reinforcing
**Continex SRF-NS**—Natural Gas Type, Non-Staining
**Continex HMF**—Natural Gas Type, High Modulus
**Continex HAF**—Oil Type, High Abrasion
**Continex FEF**—Oil Type, Fast Extruding
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Witco-Continental's technical service staff will be glad to assist you with your rubber formulation problems.

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**SPECIFY EMERY FATTY ACIDS *everytime!***

In selecting the constituents that go into your products, you can't be too careful in getting the highest quality available, consistent with performance requirements and cost limitations.

When it comes to fatty acids, this careful selection always leads to Emery...because Emery Fatty Acids are safeguarded by modern processing methods and strict control of specifications, compositions and stability.

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Our Modern Boilers burning both Coal and Oil provide ample capacity for all requirements.

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We operate 24 hrs. per day, 7 days per week.

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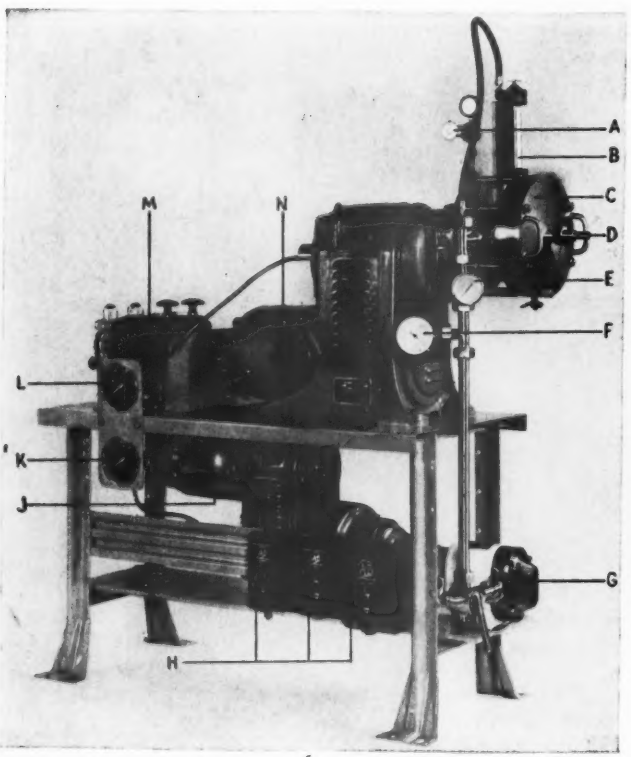


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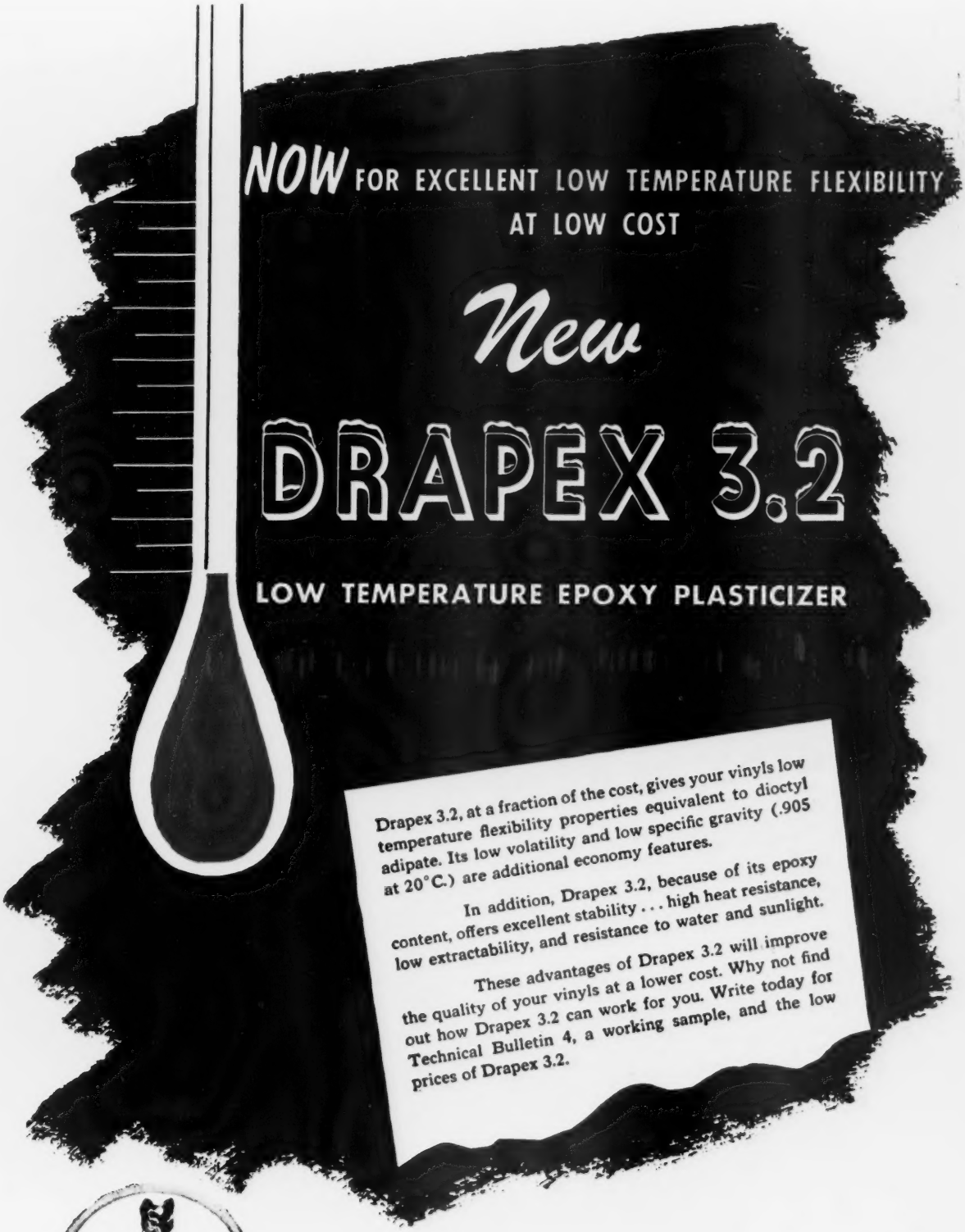

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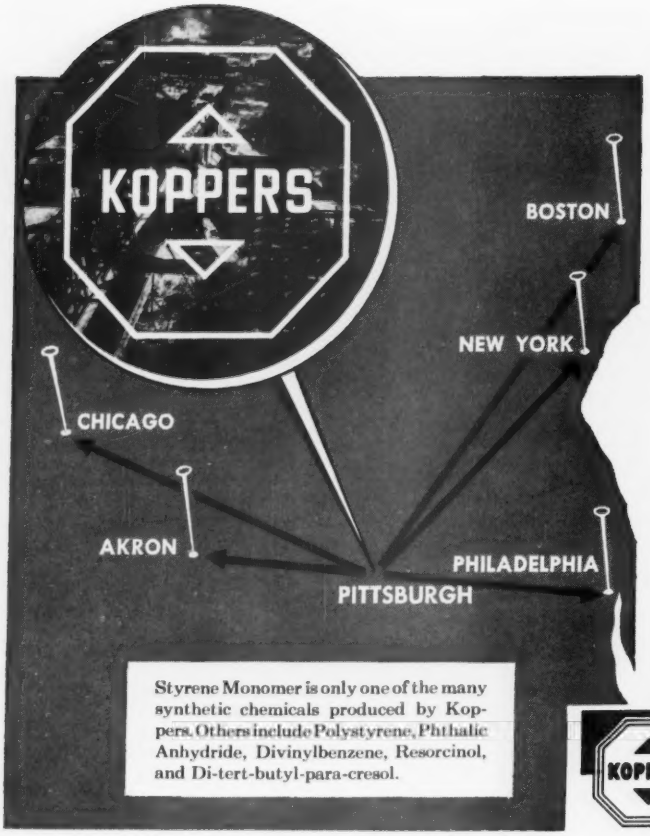


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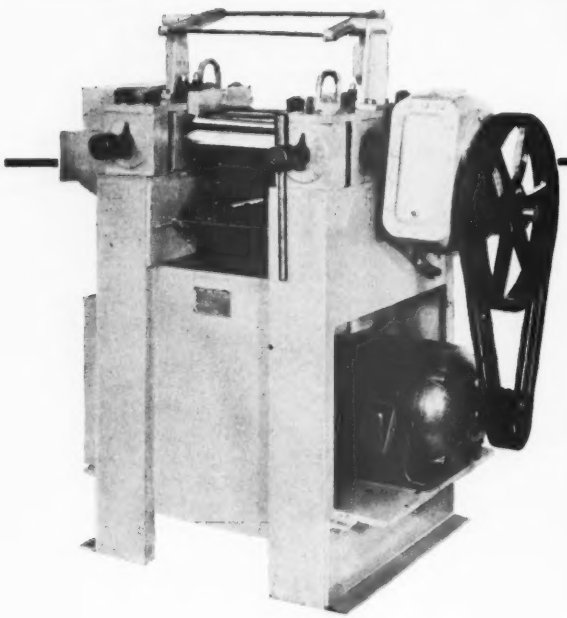

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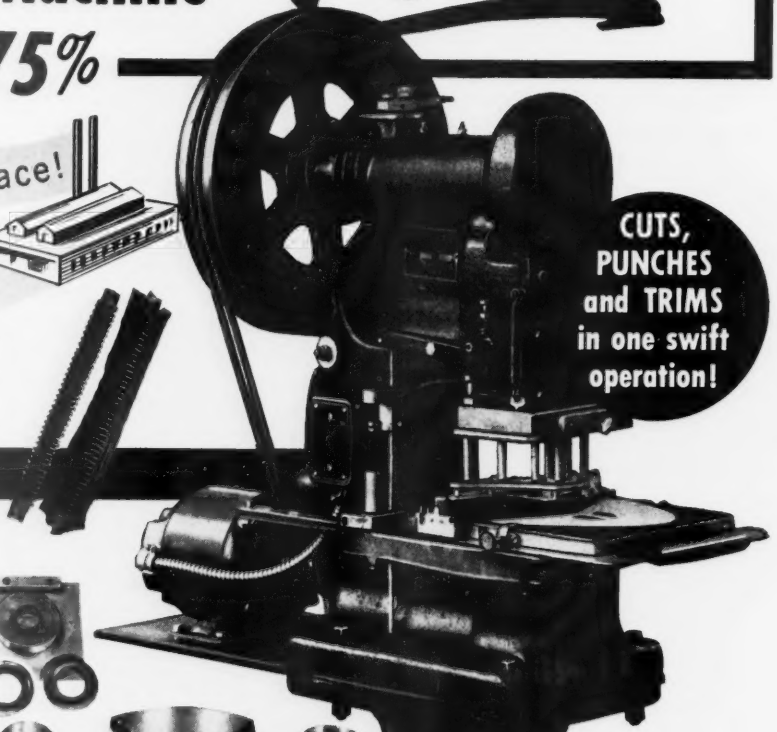

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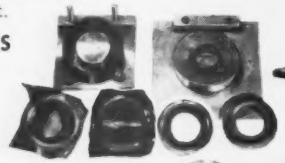

## POSITIVE SAFETY FEATURES

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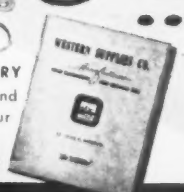

SEND SAMPLES of parts to be cut and flash trimmed for our recommendations.

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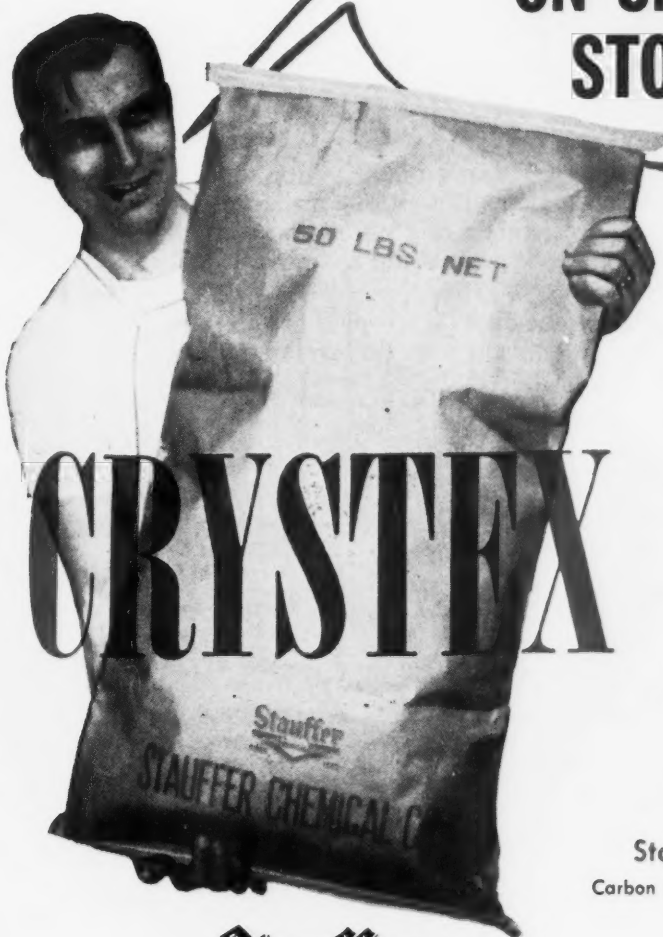


You can IMPROVE YOUR PROCESS with Crystex – 99.5% sulphur – *at least 85% of which is rubber-insoluble* at the usual milling temperatures! You can *depend* on Crystex for uniformly high insoluble rubber content.

CRYSTEX replaces ordinary sulphur for rubber-makers – in tire carcass stocks, white side-walls, valve patch frictions, retreads and other repairs stocks, and in many plied-up mechanical stocks.

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# ACTIVATOR NEWS

HORSE HEAD PRODUCTS

A supplement to THE ACTIVATOR—the house organ issued by The New Jersey Zinc Company for over 15 years to aid the Rubber Industry in its use of Zinc Oxide.

## UNIQUE COATING *on ZINC OXIDE outwits humidity*

Customers tell us that, even in high humidity, switching to PROTOX*-166 ZINC OXIDE provides uniformly fast mixing and excellent dispersion.

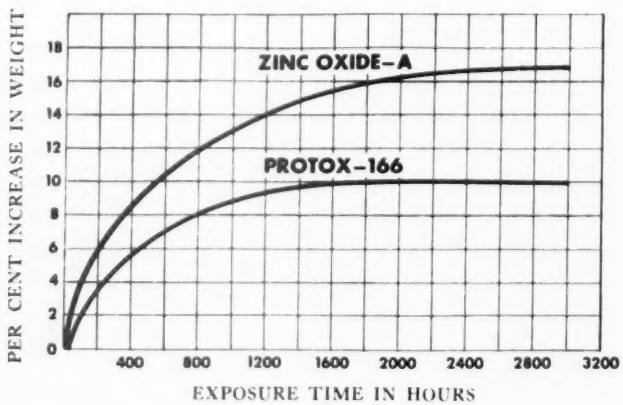
The outstanding humidity resistance of PROTOX-166 stems from the patented coating of zinc propionate that seals the individual particles. Here is how it works:

1. It reduces moisture pickup (see chart).
2. It prevents aggregation that leads to poor dispersion.
3. It is readily wetted by rubber.

*U. S. Patents 2,303,329 and 2,303,330

### MOISTURE ABSORPTION OF ZINC OXIDES

*under saturated conditions at 77° F.*




Protox-166, surface-coated with zinc propionate, picks up less moisture in storage than do untreated types, such as Zinc Oxide-A, and thus processes more uniformly and faster.

### TEST PROCEDURE

Three grams of pigment were weighed into wide-mouth (2" dia.) weighing bottles and conditioned for 24 hours over calcium chloride at room temperature. After determining the net weights of the samples, the bottles were stored, unstoppered, over water in a large container held in a constant temperature (77°F.) room. The thin layer of each sample was stirred once daily to assure a uniform condition throughout the oxide, and was weighed periodically to determine the per cent increase in weight.

*NOTE: The per cent moisture pickup for zinc oxides in this test is, of course, far more than would occur under industrial storage conditions in multi-walled bags.*

**THE NEW JERSEY ZINC COMPANY**

*Producers of Horse Head Zinc Pigments*

*... most used by rubber manufacturers since 1852*

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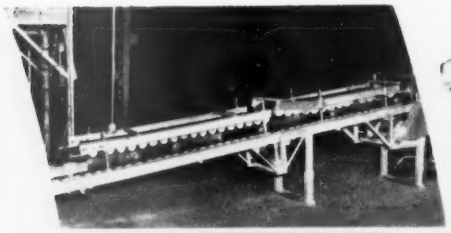
# Shipping Clay the thrifty Huber Way



**1. De-airing Machine** squeezes excess air from every bag of Huber Clay. Result: same high-quality clay, but a flatter bag that saves 20% storage space. De-airing gives a squarer bag, more secure loads, less loss in transit and use.

**2. Unit Loads** are stacked as de-aired bags come off roller conveyors. Normal weight per load is 3000 pounds. Load base is wooden pallet, or expendable fibreboard. Loose bag loads are also available.

**3. Car Ready for Shipment:** Note fibreboard sheet separators which prevent chafing and bag interlocking.

**4. Unloading** can be entirely mechanical with Huber Unit Loads.

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Huber clays are packed and shipped to permit unloading in a minimum of time and to save the user the maximum of storage space. Huber does this by de-airing the bags and offering loads on fibreboard sheets or wooden pallets—Huber "firsts" in each case.

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VOLUME 75
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50th ANNIVERSARY 1904 1954 NAUGATUCK CHEMICAL

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RUBBER AGE

Vol. 75, No. 3 JUNE, 1954

# Application of Radiometric Procedures to the Evaluation of Surface Cracking of Elastomers

By JOSEPH L. KALINSKY

*Head, Radioisotope Unit, Material Laboratory, New York Naval Shipyard, Brooklyn, N. Y.*

and T. A. WERKENTHIN

*Head, Elastomer Branch, Research and Development Division, Bureau of Ships, Navy Department, Washington, D. C.*

**Radioisotope-tracer techniques have been applied to the development of methods for the quantitative estimation of the surface cracking of elastomers. Procedures are described in which crack volume is measured radiometrically from the volume of a radioactive powder included within the cracks. The use of radiations of different penetrability permits discrimination between volume and surface area of the cracks, the ratio of which is proportional to average crack depth.**

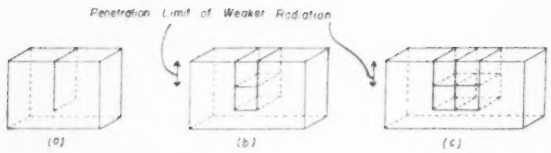
OF the so-called "glamour" tools available to present day scientific and technical workers, radioisotope-tracer techniques are probably the most intriguing. Radioisotope-tracer techniques are finding a continually broadening application in fundamental research and development of methods for testing of industrial materials. The radioisotope technique is of particular value because the sensitivity of measurement is greater by several orders of magnitude than that attainable by conventional physical or chemical methods. The work described herein, performed at the Material Laboratory, demonstrates how advantage may be taken of this sensitivity together with differentiation of radiation to provide a unique and effective method of assessing the extent of cracking of ozone-deteriorated rubber.

Note: The opinions or assertions contained in this article are those of the authors and are not to be construed as reflecting the views of the Navy Department or the Naval Service at large.

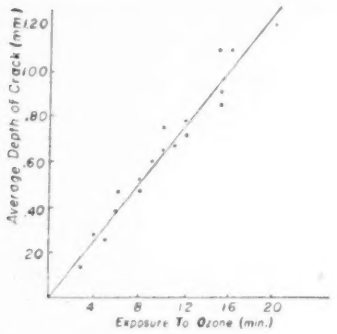
Typical of the methods which have been used for crack measurement are those of Rugg *(1)* in which the individual cracks along the edge of a strip cut from the specimen are examined under the microscope; of Mare Island Industrial Laboratory *(2)*, in which an obliquely-lighted, vacuum-cast Wood's metal replica is examined under the microscope and the shadow lengths measured; of Britt *(3)*, in which the cracks are measured by x-ray absorption techniques; of Werkenthin *(4)*, in which the volume of crack per unit surface area is determined by the weight of a filling powder included within the cracks, and of Buckley *(5)*, in which the relaxation of the tensile specimen caused by the surface cracking is determined by strain gauge measurements.

These methods, though suitable for specific applications of crack measurement, are inherently restricted to laboratory investigations. The Bureau of Ships, U. S. Navy, thus considered the need for a method of general applicability, without sacrifice of accuracy, speed of measurement, or simplification of operation and necessary equipment. Accordingly, it approved a proposal made by one of the authors (Werkenthin) to establish at the Material Laboratory a project for the possible adaptation of this method for field use.

The gravimetric method of Werkenthin, as utilized in the laboratory, expresses results in terms of crack volume per unit surface area for a predetermined and specified distension of the elastomer specimen. Lateral variation of the crack volume is controlled by this fixed




1. Section of Cracked Specimen with (a) Zero, (b) One Unit, and (c) Two Units Elongation.




2.

*FIG. 1—Relationship between factors affecting measurement of crack depth: (1) Surface to total volume and extension; (2) Time of ozone exposure and crack depth.*

elongation, thus permitting the volume measurement to be used as a function of the average depth of cracks with certain limitations. However, for random determinations as encountered in field evaluation, the extent of the elongation may not be known or subject to control. It is thus necessary to modify the procedure to obtain information of crack dimensions independent, or practically so, of variations of the specimen elongation, namely, the crack depth (Figure 1.1), and so more adequately estimate the severity of the cracking of the elastomer. In addition, the accuracy of the method is limited by the incomplete recovery of the filling powder for weighing purposes. As much as 50 percent of the powder may be retained within the cracks because of the tackiness of the deteriorated elastomer.

In order to obviate these difficulties, the proposal therefore suggested the incorporation of a radioisotope into the filling powder and the radiation measurements thereof to indicate directly the amount of powder included within the cracks. The initial phase of the investigation utilized the single radiation measurement to determine directly the volume of crack per unit surface area without the need for recovery and weighing. The procedure was further modified by making two discriminate measurements of individual types of radiation from the same isotope, differing in their power to penetrate and ionize absorbing media. These measurements were correlated to terms of volume and surface area of the cracks, the ratio of which is proportional to average crack depth, independent within wide limits of the elongation of the elastomer. Another modification of the powder filling technique, called the back-scatter method, employs inert powder filling, and an externally mounted source of radiation to determine the volume of crack per unit area of surface of the exposed elastomer, and is described fully within the body of this report.

The work described herein is exploratory in nature, and was undertaken to determine the feasibility of utilizing radioisotope-tracer techniques to develop improved methods for the measurement of the degree of surface cracking of natural and synthetic rubbers and plastic elastomers resulting from ozone attack.

## Principles of Radiation Measurement (6)

To keep the subject matter within the interest of the described procedures, only the alpha, beta, and gamma nuclear radiations will be discussed. The reader is referred to the addenda section on "Physical Nature of Radiations from Radioactive Substances" for a more detailed account of the behavior of radioisotopes.

Nuclear radiations both corpuscular and electromagnetic are detectable only through their interactions with matter, usually in the form of ionization of the absorbing medium. The three types of radiation measured in this investigation are described briefly as follows:

*Alpha Rays:* The alpha ray as it is emitted from the atomic nucleus is the doubly-positive-charged helium ion, and is most commonly found as a particle emitted from some natural or artificially prepared elements with atomic numbers greater than that of lead. Although of high energy (several million electron volts), the alpha particle suffers a large number of collisions with electrons and is brought to rest rapidly. The alpha particle is thus characterized by its low penetrating power (up to about 6 cm of air) and by the consequent large number of ions produced per unit length of path in a gas, or as it is defined, a high specific ionization. Alpha particles from the same element are emitted with the same initial energy, and thus possess the same range.

*Beta Rays:* The term beta ray is commonly used to designate electrons, either positive or negative in charge, originating from the nucleus of an atom during radioactive disintegration. Unlike the alpha ray, beta particles are emitted in a spectrum of energies, with an average energy of about 40 percent of the maximum value. Unlike the alpha ray, the beta ray encounters considerable straggling and deflection in its path through an absorber. This straggling is further increased by the pronounced scattering of the electrons into different directions under the influence of the electrons and coulombic fields of the nuclei. A very significant fraction of the incident electrons may be reflected (that is, scattered through more than 90°) as a result of these single and multiple Rutherford scattering processes. The back-scattering factor, or increase of reflected intensity, increases faster with increasing backing thickness, the lower the energy of incident radiation and the higher the atomic number of the backing or reflecting material, and reaches a saturation value when the thickness is about one-fifth of the normal range of the beta particle. The combined effects of continuous spectrum and scattering lead fortuitously to an exponential absorption for beta particles of a given maximum energy. For a given energy, the specific ionization of the beta ray is about one thousandth that of the alpha ray. (The converse is true for penetration or range).

*Gamma Rays:* Gamma radiation usually means the high-energy electromagnetic radiation emitted from the nucleus of the atom during the course of nuclear disintegration. A nucleus may emit several gamma rays during disintegration but they are found in discrete energy groups, rather showing a continuous spectrum of energies. Gamma radiation is much more highly penetrating than either alpha or beta radiation (Figure 2), and is detectable by the secondary ionization produced in the interaction of the photons with the absorbing medium by three processes: photoelectric effect, Compton scattering effect, and pair production. The specific ionization of a photon is the lowest of the radiations considered, and is measured with a poor efficiency (1 percent) by ionization chamber detectors.

It is thus possible to detect and discriminate between radiations of different ionizing powers and penetrability utilizing the following equipment:

*Electrometer Type Ionization Chambers:* A two electrode chamber consisting of a cathode cylinder and center anode wire, with an applied potential of the order of 150 volts depending upon the electrode distance. The radiation particle produces ions in the confining gas, usually air, which drift to the corresponding electrode and reduce the applied charge. The decay rate is proportional to the number of ions formed from the incoming particle, and thus a function of the specific ionization for a particular activity.

*Proportional Geiger-Muller Counter:* If the voltage is raised to a certain value, depending upon the geometry of the counter and the gas, the pulse size begins to increase. An electron produced by the primary particle will drift toward the center wire and initiate an electron avalanche by successive collisions. Since this multiplication of the ionization takes place in the immediate vicinity of the wire the avalanches produced by the different electrons are mostly of identical size. The resulting charge is proportional to the number of electrons initially produced by the primary particle. Since the pulse size per particle is proportional to the ionizing power, by suitable discrimination in the amplifying circuit the individual radiations can be measured. It is also possible to discriminate between beta particles, providing the maximum energy of emission is of considerable difference.

*Geiger-Muller Counter:* At a certain voltage, usually between 800 and 1200 volts, depending on the type of gas, etc., a single avalanche produced by an electron generates new avalanches and the discharge is spread through the whole counter and all the pulses are equal. This voltage is known as the Geiger threshold. The sheath of positive ions around the wire reduces the field sufficiently to prevent further avalanches, and moves to the cathode in about 200 microseconds (dead time of the counter). During this migration to the walls of the tube, the positive ions, usually helium or argon, will collide with an organic quench gas, such as alcohol, and will transfer their charge to these polyatomic molecules. Only these ions reach the cathode and are neutralized, causing dissociation. Therefore, no new electrons are formed to be able to initiate a new cycle. Thus, any particle of radiation which can enter the sensitive volume of the counter and be absorbed will be detected and measured by the scalar regardless of energy or specific ionization.

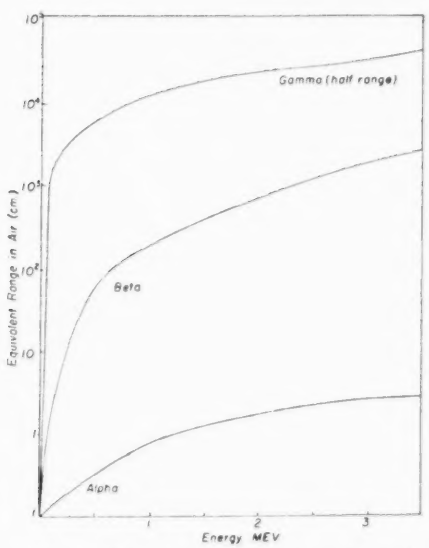



*FIG. 2—Range-energy relationships in air for alpha, beta and gamma radiations.*

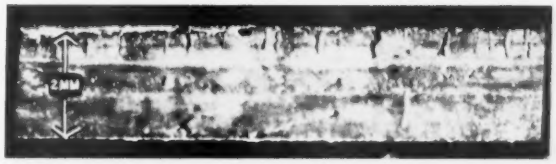



*FIG. 3—Section of cracked rubber showing distribution and size of cracks.*

The following are the depths of cracks (in mm.) measured microscopically:

| | | |
|---|---|---|
| 0.52 | 0.46 | 0.55 |
| 0.49 | 0.56 | 0.53 |
| 0.52 | 0.47 | 0.41 |
| 0.46 | 0.52 | 0.50 |
| 0.43 | 0.48 | 0.52 |

Mean = 0.50 mm.; Max Dev. = 18%; Av. Dev. = 0.037 mm.; Std. Dev. = 0.045 mm.

## Procedure

In the interest of standardization and comparison of results, all tests were performed on a single elastomer type, namely, nitrile rubber gasket stock, ⅛-inch thick, cut into tensile strips 1-inch wide and 6 inches long. These strips were mounted in a X1-A specimen holder, elongated 10 percent, and placed in the chamber to which ozone was admitted. The ozone was produced in concentrations of 50 parts per million in pure oxygen which passed through an annular space around a mercury-vapor, ultraviolet lamp. The time of ionization was calculated to give the various degrees of cracking of the specimen (see Figure 1.2) required for the test of the proposed procedure. To simulate field conditions of exposure, the reverse side and edges of the specimen were protected from ozone attack by a coating of scotch tape or a plastic spray before exposure.

The technique for filling the cracks of the specimen was the same for all methods, that is, the appropriate filling powder was gently worked into the cracks with a dental spatula, care being taken to avoid undue distension of the cracks in the process. The surface area for the powder application was restricted to about one square inch by placing two strips of transparent tape across the specimen at a distance apart of 1 inch. The excess powder was removed from the area by means of a soft camel's hair brush.

The direct determination of crack-depth, for calibration purposes, was made by cutting a narrow, longitudinal section from the ionized specimen and examining its edge under a measuring microscope similar to the method described by Rugg *(1)*. A specimen of such a section, showing the size and distribution of the individual crack, is seen in Figure 3.

*Single Measurement Technique:* This is the initial modification of the Werkenthin gravimetric method. A small amount of material was taken from a radium-enriched phosphor used as a deck-marker for shipboard and incorporated into the test powder containing 95 percent lead sulfate and 5 percent silica gel, in the ratio of 1:7. In order to obtain a linear relationship between weight of powder and radioactivity, it was necessary to use an aluminum absorber of thickness 880 mg/cm² (⅛-inch) to screen out the beta (and alpha) radiations

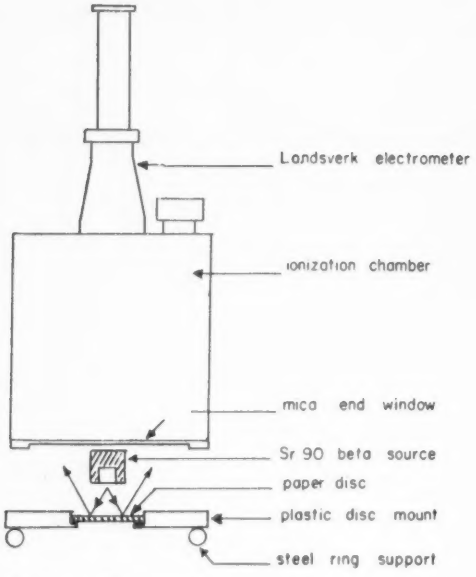



*FIG. 4—Diagram of apparatus for back-scatter measurement of lead nitrate extracted from cracks of ozonized nitrile.*

and thus measure the highly penetrating gamma radiation. In order to compare these results with the inert gravimetric method, the sample was then inverted, and tapped. The recovered powder was collected into a weighing dish, weighed, and the sample recounted for residual radiation. An end-window Geiger-Muller counter with two inches of lead as shielding was attached to a scalar to detect the radiation.

*Back-Scatter Technique:* In this procedure, an inert powder of high atomic number is used to fill the cracks of the specimen, and a source of strong beta radiation externally mounted and placed between powder and radiation detector. Two types of ionization counters were used for this procedure—the Landsverk electrometer, Model 75B, and the Tracerlab, Inc., Cutie Pie Survey Meter, Model SU-1E. A holder for the strontium-90 (2.3 Mev max. from daughter Y-90) beta radiation source was machined from a ½-inch length, ½-inch diameter brass stock to form a bore hole ¼-inch in diameter and $\frac{3}{16}$-inch deep, thus giving metal shielding of ⅛-inch on the sides and $\frac{3}{16}$-inch in thickness between the source and the detector. In use, a small drop of strontium-90 chloride solution (ca. 100 microcuries) is placed in the hole in the brass cup, gently warmed to dryness, and covered with aluminum foil 0.005-inch in thickness, secured with celluloid cement.

Lead nitrate was selected as the filling powder because of its high solubility in water and high efficiency as a back-scatter material. To extend the effective range of the incident beta radiation, and to increase the sensitivity of the method, the powder was not measured in the cracked specimen, but recovered as a thin film. This was accomplished by application of 0.2 ml of water to the area of powder application, allowing five minutes for solution, and blotted by a piece of filter paper, but in the form of a disc of 1¼-inch diameter. This disc of paper containing the lead nitrate solution was dried under an infra-red lamp and then placed in a plastic holder under the source and detector, as shown schematically in Figure 4. To supply a holder for this paper disc, a 1-inch diameter hole was drilled in the center of a piece of plastic ⅛-inch thick and 3 inches in diameter. The hole was countersunk to half-depth to firmly contain the paper disc. Standardization of this procedure was accomplished by applying the same volume of standard solutions directly to the elastomer, followed by the same recovery and measurement method.

*Uranium Nitrate Procedure:* The apparatus for the two-measurement counting of the uranium nitrate filling powder consisted, for the alpha count, of a Landsverk 75B electrometer with open window, and for the beta count, either a Landsverk 75B end-window electrometer, or a Tracerlab, Inc., Model TGC-2 G-M tube and scalar assembly. The first count using powdered uranium nitrate, consisting essentially of the alpha particles with small contribution from the beta and the negligible amount from the gamma, was made by placing the open end of the electrometer over the powder-filled cracks, leaving a minimum in clearance between the specimen in the holder and the detector. This is schematically shown in Figure 5. The second count was made by placing a mica window at the base of the electrometer, or returning the specimen to the G-M tube and scalar assembly used in the single measurement method. The windows of these detectors absorb all of the alpha (and very weak beta) radiations, and effectively count the beta particles with but a small contribution from the gamma radiation. (This contributory effect is lower for the electrometer than the G-M tube).

Because the range of the alpha particles in the powder amounts to a skin effect, the alpha measurement can be interpreted in terms of area of the surface cracks. The high energy beta radiation (2.3 Mev max.) suffers only minor self-absorption up to several millimeters depth of crack, and can be expressed in terms of volume of crack. The results of these counts are presented as the ratio of the beta (plus negligible gamma) to the alpha (plus negligible beta) and plotted against the average crack depth.

*Cobalt-60 Oxalate Procedure:* Cobalt-60 emits two strong gamma rays with an average energy of 1.22 Mev, simultaneously with a weak beta of 0.31 Mev max. energy. Radioactive cobaltous oxalate, used as the filling powder, was prepared by adding 0.01 ml of cobalt-60

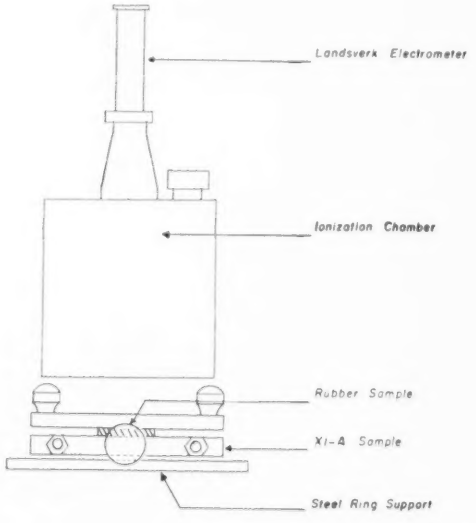



*FIG. 5—Diagram of apparatus for alpha activity measurement of uranium nitrate in cracks of ozonized nitrile rubber.*

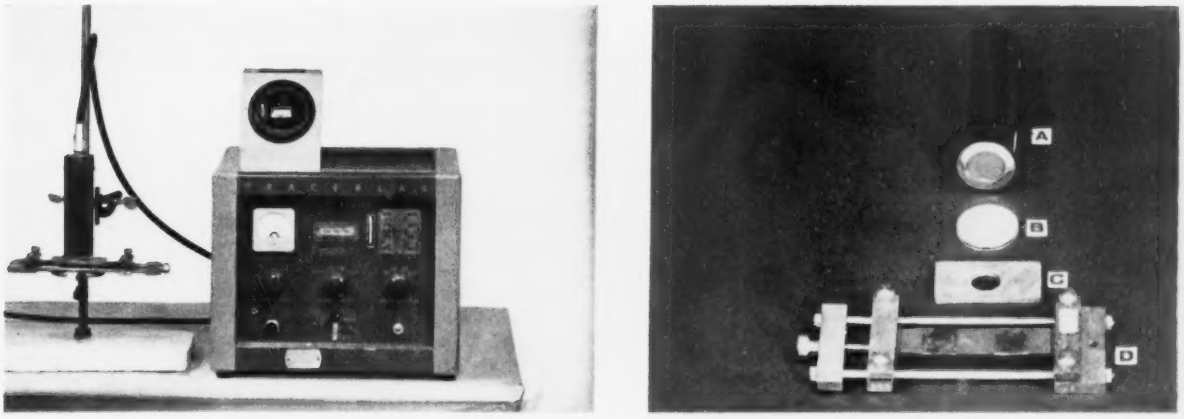



*FIG. 6—Counting assembly for measurement of surface cracking of elastomers using radioactive powder.*

A—Thin mica end-window G. M. counter; B—Aluminum absorber, 134 mg/cm² (approximately 0.020-inch); C—¼-inch thick lead screen; D—X1-A specimen mount.

chloride solution, as supplied under U.S.A.E.C. Catalog No. 27-9, to 100 ml of solution containing 3.9 gm of non-radioactive, hydrated cobaltous chloride. This solution was warmed and 50 ml of a 6 percent w/v of ammonium oxalate added slowly with vigorous stirring. After cooling to room temperature, the precipitate of finely divided cobalt-60 oxalate was filtered, washed and dried in a vacuum oven for 2 hours at 100°C. No grinding of this precipitate was required for use as a filling powder. The yield of product was 2.3 gm with a gamma and beta activity of 145 and 4400 c/m/mg, respectively, using a thin mica end-window G-M tube, Model TGC-2, and Utility Scalar, Model SC-19, of Tracerlab, Inc.

The apparatus employed for the gamma-beta counting of the cobaltous-60 oxalate filling powder consisted of the last named G-M tube and scalar assembly. The tube was mounted in a vertical position by means of a tube holder, with a mitered plate attachment which slides in matching grooves in its support attached to a stand. A Fisher Castaloy leveling bulb support with a fine-adjustment screw was used to support the specimen beneath the G-M tube. A strip of lead, 1½ inches wide, 2¼ inches long, and ¼-inch thick with a ⅞-inch hole drilled through its center, was positioned over the specimen so that the hole coincided with the area to be measured. For the gamma count, a Tracerlab, Inc., Model E-3A aluminum absorber of thickness 134 mg/cm² (ca. 0.020-inch) was placed to cover the hole in the lead strip. For counting combined beta and gamma radiations, the tube holder was raised in its slide, the absorber removed, and the tube returned to its original position, thus maintaining constant counting geometry. The counting assembly, together with the measuring apparatus, is shown in Figure 6.

The strong gamma radiation of the cobalt-60 filling powder, by virtue of its high penetrating power, can be interpreted in terms of volume of crack per unit surface area exposed, within the limits of cracking normally encountered. The range of the weak beta radiation, equivalent to a depth of about 0.8 mm in the powder, has a particular significance in determining depth and surface of crack because of the exponential self-absorbtion of the radiation within the powder. This effect will be explained more adequately under results.

## Results

*Single Measurement Procedure:* There is a linear relationship between the gamma radiation measurement and weight of powder included in the cracks of the rubber specimen. By application of apparent density factor, the radiation intensities can be expressed in terms of volume

TABLE I—RESULTS OF INITIAL MODIFICATION OF THE WERKENTHIN GRAVIMETRIC METHOD

| Sample Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Method of Powder Application | S | S | S | S | S | B | S |
| Weight of Powder Occluded (mg., uncorrected) | 34.2 | 30.5 | 26.7 | 13.0 | 21.2 | 11.0 | 27.5 |
| Weight of Powder Occluded (mg., corrected) | 32.9 | 29.6 | 25.1 | 12.5 | 20.0 | 10.8 | 26.4 |
| Weight of Powder Tapped Out (mg.) | 14.0 | 12.0 | 10.1 | 6.2 | 9.4 | 4.4 | 17.0 |
| Percent Recovery | 43 | 41 | 40 | 50 | 47 | 41 | 64 |
| B Crack Volume (mm.³/dm.²)—By Method of Reference (*4*) | 153 | 132 | 111 | 68 | 103 | 73 | 183 |
| A Crack Volume (mm.³/dm.²)—By Proposed Method | 359 | 324 | 273 | 137 | 218 | 178 | 284 |
| Ratio of A/B | 2.35 | 2.45 | 2.46 | 2.01 | 2.12 | 2.44 | 1.55 |

Note: S = Spatula; B = Brush.

CALCULATIONS

The area exposed to powder on all samples is 5.62 cm.²
The apparent density of powder with spatula application is 1.63 mg./mm.³
The apparent density of powder with brush application is 1.08 mg./mm.³
The conversion of weight of occluded powder to volume of cracked surface, expressed as mm.³/dm.² of surface:

$$\text{Volume/unit area} = \frac{\text{mm.}^3}{\text{dm.}^2} = \frac{\text{Weight of Powder}}{\text{Apparent Density}} \times \frac{100}{5.62}$$

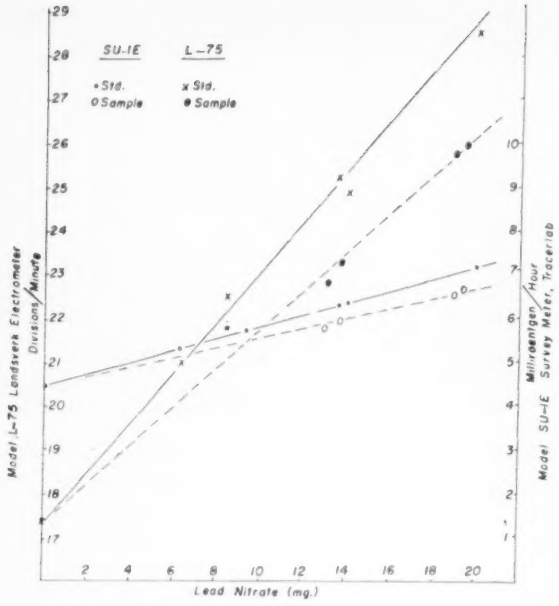



*FIG. 7—Relationship between backscatter activity and weight of lead nitrate.*

of crack per unit surface area. In order to compare results to the inert gravimetric method, the specimen was inverted and gently tapped to dislodge the included powder. (This recovered portion of the powder is the basis for the determination of crack volume for the original method). The results of this procedure are listed in Table I, and show incomplete recovery of powder (ca. 45%) due to the tackiness of the ozonized specimen.

*Back-Scatter Procedure:* The results of the counting of the reflected radiation of Sr. 90 beta source from lead nitrate filling powder, transferred to and absorbed by filter paper discs, is shown graphically in Figure 7. The efficiency of extraction of the powder for measurement was 85% within narrow limits, thus allowing the use of an empirical factor for calibration purposes. 20 mg of lead nitrate corresponds to an approximate average depth of 1.3 mm. Apparent density factors were not applied, since in determining the feasibility of any proposed method, the weight of powder, which is directly related to the volume, can be used for a measurement criterion. Like the method previously described, results of this procedure can only be interpreted in terms of volume of crack per unit surface area.

*Uranium Nitrate Procedure (Alpha-Beta):* The results of this procedure are listed in Table II and graphically shown in Figure 8. The volume measurement is derived from the strong beta radiation, with a little deviation caused by the self-absorption factor of the weak beta particles of the complex uranium series. The alpha particles contribute radiation proportional to the composite surface area of the cracks. There is, therefore, a linear relationship between the ratio of the beta (volume) to the alpha (surface area) activity versus the average depth of crack, the latter determined by microscopic means.

*Cobalt-60 Oxalate Procedure (Beta-Gamma):* The results of this procedure are listed in Table III and graphically shown in Figure 9. The volume measurement is derived from the strong gamma radiation, which encounters negligible self-absorption. The weak beta radiation is exponentially self-absorbed up to crack depths of 0.8 mm (infinite thickness or range). Beyond this depth, no beta radiation will be detected and thus becomes a constant factor for area measurements. There is thus essentially a linear relationship between the ratio of gamma to beta activity and the average depth of crack. The deviation from linearity is caused in part by a blank value resulting from imperfect removal of the powder from uncracked portions of the specimen, and also by the fact that for cracks under 0.8 mm in depth the radiation from the beta component will no longer be a constant factor for area, but will vary with the depth of crack in accordance with an exponential function.

## Summary

The direct application of radioisotopes to the crack powder-filling procedure provides a quantitative method for the estimation of surface cracking of elastomers due to ozone aging. Radiation intensity measurements, made

TABLE II—RESULTS FOR THE URANIUM NITRATE PROCEDURE

| Sample No. | Wt. Powder Contained (mg) | Beta/Alpha Ratio (cpm/dpm) | Average Crack-Depth (mm) |
|---|---|---|---|
| 1 | 5.5 | 52.5 | 0.54 |
| 2 | 9.5 | 56.2 | 0.60 |
| 3 | 11.0 | 76.0 | 0.80 |
| 4 | 10.8 | 70.0 | 0.68 |
| 5 | 3.7 | 36.7 | 0.45 |
| 6 | 10.0 | 73.7 | 0.64 |
| 7 | 4.6 | 52.0 | 0.55 |
| 8 | 6.7 | 81.6 | 0.86 |
| 9 | 5.8 | 55.8 | 0.55 |
| 10 | 7.5 | 63.0 | 0.66 |
| 11 | 5.2 | 59.5 | 0.59 |
| 12 | 7.0 | 55.0 | 0.57 |

Note: cpm dpm = counts per minute/divisions per minute.

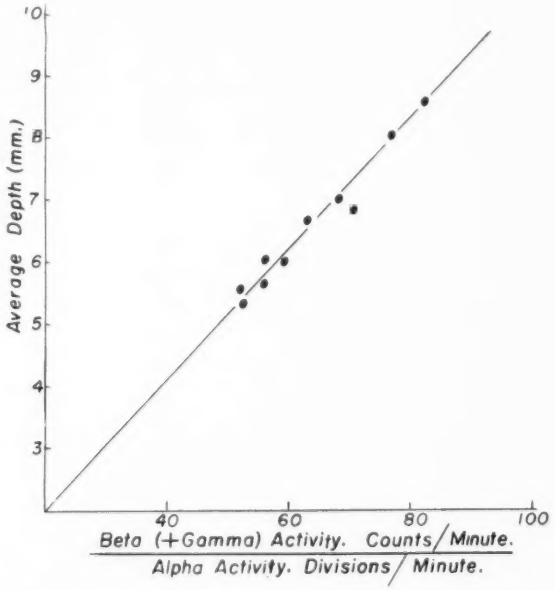



*FIG. 8—Relationship between average depth of ozonized nitrile rubber and radioactivity of uranium nitrate.*

TABLE III—RESULTS FOR THE COBALT-60 OXALATE PROCEDURE

| Sample No. | Time of Exposure to Ozone (50 ppm) (min.) | Gamma/Beta Ratio (cpm/cpm) | Average Crack-Depth (mm) |
|---|---|---|---|
| 1 | 5 | 0.070 | 0.25 |
| 2 | 12 | 0.097 | 0.78 |
| 3 | 8 | 0.069 | 0.52 |
| 4 | 4 | 0.062 | 0.28 |
| 5 | 12 | 0.089 | 0.71 |
| 6 | 6 | 0.060 | 0.38 |
| 7 | 3 | 0.067 | 0.14 |
| 8 | 20 | 0.158 | 1.20 |
| 9 | 15 | 0.104 | 0.90 |
| 10 | 10 | 0.083 | 0.64 |
| 11 | 6 | 0.083 | 0.47 |
| 12 | 15 | 0.091 | 0.84 |
| 13 | 11 | 0.080 | 0.67 |
| 14 | 8 | 0.072 | 0.47 |
| 15 | 15 | 0.133 | 1.09 |
| 16 | 20 | 0.160 | 1.25 |
| 17 | 10 | 0.082 | 0.75 |

Note: cpm cpm = counts per minute/counts per minute.

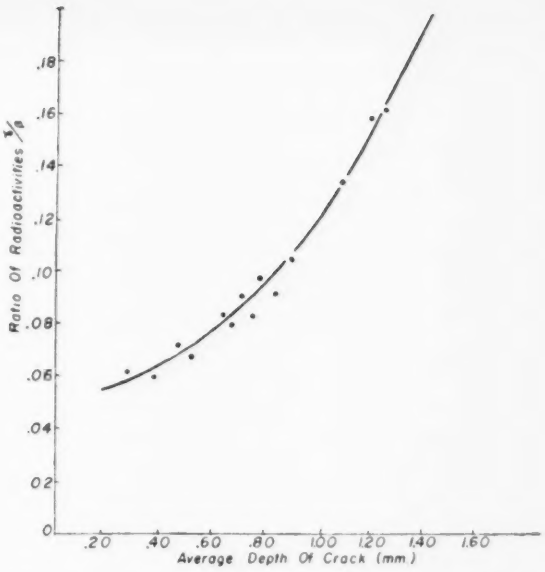



*FIG. 9—Relationship between the average depth of crack and ratio of radioactivities gamma/beta of nitrile rubber using Cobalt-60.*

*in situ* from the specimen, of various types of emission differing in their degree of penetration or range can be interpreted in terms of crack dimensions:

1. Alpha and low energy beta rays are characterized by their low penetrating power. The intensity of measurement of these types of radiation is related to the quantity of powder deposited in the upper layers of the cracks and, therefore, a function of the surface area of the cracks.

2. High energy beta and gamma rays are characterized by their relatively high penetrability, the latter several hundred times more than the former. The intensity of measurement of strong beta radiation (for crack depths up to a few mm) and of gamma radiation (for crack depths up to 1 cm) is related to the total quantity of powder included within the cracks, and, therefore, a function of the volume of crack per unit area exposed.

3. The ratio of volume to surface radioactivity is a direct, linear function of the average depth of crack.

For laboratory investigations, as used for comparison purposes, where the elongation of the specimen can be predetermined, single measurement procedures utilizing gamma or beta back-scattered radiation can be satisfactorily applied. For field use, or for random specimens, where the elongation factor is either unknown or not subject to control, a crack dimension, namely crack depth, more or less independent of the elongation, is desirable. This information is obtained by the double radiation measurement, discriminating between the different types of emission, of the uranium-238 (within limits) and the cobalt-60 powder-filling procedures.

# Physical Nature of Radiations From Radioactive Substances

### ALPHA RAYS

The alpha particle as it is emitted from the atomic nucleus is a doubly positive charged helium ($He^{++}$). It is commonly found as a particle emitted from certain natural or artificially prepared elements with atomic numbers greater than that of lead. Alpha particles emitted from the same isotope are practically monoenergetic, with emission energies on the order of several million electron volts, and are of the same penetrating power or range within narrow limits. In passing through matter, alpha particles lose energy chiefly by interaction with electrons, causing excitation or ionization of atoms and molecules, but are hardly deflected from the original path. Especially in gaseous absorbing media, ionization provides a most convenient method of detection and measurement. Although only a small fraction of its energy is dissipated in a single collision (32 electron volts per ion pair formed) with an electron, the alpha particle suffers a large number of collisions (ca. $10^5$ for $\alpha$ of 2 Mev).

The secondary electrons or delta rays are fast enough to produce further ionization; this secondary ionization accounts for approximately 70% of the total ionization. The energy and velocity of the alpha particle decrease rapidly per unit path through the absorbing medium with the particle coming to rest within a few cm of air. The specific ionization, the number of ion pairs formed per millimeter of path, varies inversely with the velocity of the alpha particle, and attains a maximum of about 3.0 mm from the end of its range and then falls rapidly to zero. In summation, the alpha particle, though of high energy, is characterized by its relatively low penetrating power and by the consequent large number of ions produced per unit length of path in a gas.

### BETA RAYS

The term "beta ray" is commonly used to designate electrons originating from the nucleus of an atom during radioactive disintegration. The interaction of electrons with matter, the average energy loss per ion pair formed,

and contribution to total ionization by secondary electrons are fundamentally similar to that of alpha particles. However, for a given energy, the velocity and range of an electron is much larger than that of an alpha particle and therefore the specific ionization is considerably less for electrons (ca. 1/1000 that of the alpha particle of similar initial energy) and varies inversely as the square of the velocity.

Beta rays from any particular isotope, unlike alpha rays, are emitted in a spectrum of energies, the average energy being approximately 40% of the maximum usually given in reference tables. For example:

| Radioisotope | Max. Energy (Mev) | Average Energy (Mev) | Average Energy (% of max.) |
|---|---|---|---|
| Phosphorus-32 | 1.71 | 0.693 | 40.5 |
| Carbon-14 | 0.155 | 0.053 | 34.2 |

## Back-Scattering

Although alpha rays suffer negligible deflection and straggling in passing through matter, the beta ray encounters considerable straggling. The apparent straggling is further increased by the pronounced scattering of the electrons into different directions under the influence of electrons and coulombic fields of the nuclei of the absorbing medium. A very significant fraction of the number of electrons falling on a piece of material may be reflected (that is, scattered through more than 90° from the incident path) as a result of these single and multiple scattering processes. The reflected intensity increases with increasing thickness of reflector, reaching a saturation value, theoretically, if the thickness is equal to half the range of the beta particles. Practically, the maximum backscattering is obtained when the thickness is 1/5th of the range. The backscattering factor increases faster with increasing backing thickness, the lower the energy of the incident radiation and the higher the atomic number of the backing or reflecting material. Saturation values are found to be independent of the energy between 0.3 and 2.3 Mev. The table *(7)* in Figure 10 lists the relative amounts of ionization produced in an electroscope by a radiation source $R_a$ E ($E_{max}$–1.17 Mev) with infinite thicknesses of various reflectors behind it. The graph was taken from Carlin *(8)* in his treatise on backscatter gauge instrumentation.

## Absorption of Beta Particles

The combined effects of continuous spectrum and scattering lead quite fortuitously to an approximately exponential absorption for beta particles of a given

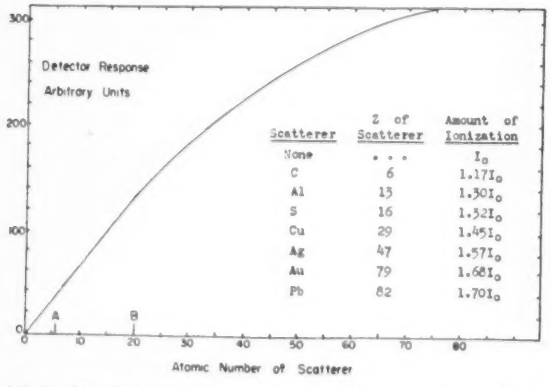



*FIG. 10—Effect of atomic number on scattering ability.*

maximum energy. Absorption curves, that is, curves of activity versus thickness of absorber traversed, are for this reason usually plotted on semilogarithmic paper. The absorption of beta rays may be represented by an exponential law: $A_x = A_o e^{-ux}$, where $A_o$ is the measured activity without absorber and $A_x$ the activity observed through absorber of thickness x (in cm), and u the absorption coefficient ($cm^{-1}$).

It is advantageous, however, to measure the mass per unit area d (surface density) of the absorber rather than its thickness. Since $d = px$, the exponent becomes $ux = (u/p)d$ where u/p is the mass absorption coefficient (in $cm^2/g$). This quantity is nearly the same for mica, air, and aluminum, and varies about as Z/A, that is, the number of electrons per unit mass determines the mass stopping power of a substance for beta particles. The thickness required to reduce the measured activity to one half its initial value is called the half thickness and to a first approximation amounts to about 0.14 of the range.

Range-energy relationships for beta particles have been reported by such authorities as Feather and Glendenin *(9)* in several publications. This is useful not only in approximating the maximum energy and identification of a beta ray, but also in estimating the thickness of absorber, usually expressed in $mg/cm^2$ of aluminum, required to screen out the beta particles when measuring other more penetrating types of radiation of the same isotope. Thus, an absorber of 80 $mg/cm^2$ will effectively screen out the 0.31 Mev beta particles of Cobalt-60, but will have negligible absorption effect on the measurement of the two concurrent gamma rays of 1.22 Mev average energy. Some approximate equations have been proposed for a range-energy relationship of normal beta spectra:

When E <0.2 Mev, $R = E^{3/2}/150$, where E is max. energy in Mev
E >0.6 Mev, $R = 0.543E - 0.160$, E is max. energy in Mev
E >0.8 Mev, $R = 0.542E - 0.133$, E is max. energy in Mev

## Self-Absorption

A very complex effect compounded of absorption and back-scattering occurs in all but the thinnest beta particle sources. This so-called self-absorption effect for a given sample thickness in $mg/cm^2$ appears to decrease with increasing Z, perhaps about $Z^{-1/2}$. For the calculation of the self-absorption effect within the source, an exponential absorption with an absorption coefficient u independent of the depth in which the particles are emitted is assumed. There are two types of self-absorption curves *(10)* normally encountered in radiation measurement of beta particles as follows:

(a) Curve obtained by increasing the source thickness, keeping the total activity constant (dilution): If the total number of counts registered for a thin source is $m_2$, then counts due to a layer of thickness dx would be

$$dm = m_2 \frac{dx}{t}$$

if there were no absorption. The absorbing layer x reduces this by $e^{ux}$. The total intensity measured is

$$m = \frac{m_2}{ut}(1 - e^{-ut})$$

(see Figure 11a).

(b) Curve obtained by increasing the source thickness keeping the measured specific activity (concentration) a constant: The activity of a source of thickness t would be $m_2$=at without absorption and the measured counting rate is approximately

$$m = \frac{a}{m} (1 - e^{-mt})$$

which is the familiar type of saturation curve (see Figure 11b).

## GAMMA RAYS

By gamma radiation one usually means the high-energy electromagnetic radiation emitted from the nucleus of the atom during the course of nuclear disintegration. Quantum energies of this radiation usually lie from 100,000 to several million electron volts. A nucleus may emit several gamma rays during disintegration but they are found in discreet energy groups, rather than showing a continuous range of energies. Since gamma radiation is usually much more penetrating than alpha or beta radiation, experimental problems usually center around absorbing and detecting as much of the radiation as possible, rather than any difficulty involved in getting the radiation into the measuring apparatus.

### Processes Responsible for Energy Loss

In their interaction with matter, gamma rays lose energy predominantly by three processes that result in the production of fast moving electrons, similar to the beta radiation of nuclear radiation: (1) the photoelectric reaction; (2) the production of Compton recoil electrons, and (3) pair production of positive and negative electrons. The predominance of any process depends largely on the energy of the incident radiation and the atomic number Z of the absorbing medium.

*Photo Effect:* In this process, the electromagnetic quantum of energy ejects a bound electron from an atom or molecule, with the quantum of radiation disappearing completely in the process. These photoelectrons have discreet energies, according to the valence shell origin. The ionization produced by photoelectrons accounts largely for the ionization effect of low-energy photons. Except in the heaviest elements, photoelectric absorption is relatively unimportant for energies above 1 Mev. The probability of photo effect is largest for the electrons coupled more strongly with the nucleus, the K electron, and increases with this coupling, i.e., with Z.

*Compton Effect:* In this process only part of the energy of the photon is transferred to an electron which may be free or bound; the photon is not only degraded in energy, but also deflected from its original path. The Compton scattering per electron is independent of Z, and therefore the scattering coefficient per atom is proportional to Z. For energies in excess of 0.5 Mev, it is also approximately proportional to $E_{ph}^{-1}$ (compared to $E_{ph}^{-3}$ in the X-ray region for the photo effect). Even in heavy elements, it is the predominant effect in the energy region from about 0.6 to 2.5 Mev.

*Pair Production:* In this process the gamma quantum disappears and an electron-positron pair is created. Pair production cannot occur for energies under 1.02 Mev, with the atomic cross-section increasing slowly with increasing energy, and depends strongly on the nuclear charge, proportional to $Z^2$. Pair production is always followed by annihilation of the positron, usually with the simultaneous emission of two 0.51 Mev photons.

The atomic cross-sections for all three processes discussed increase with increasing Z, except for the photoelectric effect at low energies. For this reason, heavy elements, atom for atom, are more effective absorbers for electromagnetic radiation than light elements, with lead being the most common absorber used. The specific ionization caused by a gamma ray is about 1/100 of that caused by an electron of the same energy, at least

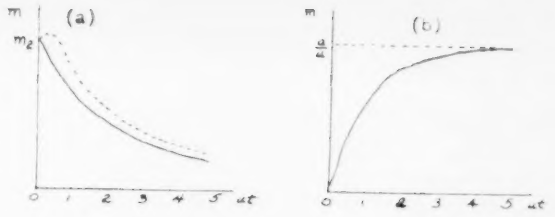



*FIG. 11—Self-absorption curves. The dotted lines indicate measurement for large source-counter distance and show effect of scattering in. In (b), the scattering effect was neglected.*

for energies greater than 100 kev. The net result is that the efficiency for counting the gamma ray by means of ionization chambers or Geiger-Muller counters is only 1% of that for measuring beta rays. Improved efficiency of counting gamma rays with these detectors has been effected by the use of the heavier fill gas, krypton, instead of helium, by increasing the surface of the cathode, and by using material of higher Z, i.e., bismuth for the cathode material.

More recent innovations for more efficient measurement of gamma rays include the use of scintillation counters, employing either crystals of thallium-activated sodium iodide, or anthracene, or liquid phosphors like terphenyl, and 2,5 diphenyl oxazole. The light pulses from these scintillators, caused by absorption of the photons, are transmitted to a sensitive phomultiplier tube, and, by suitable amplification, registered as pulses on the scalar.

## RADIOACTIVE DECAY

The nuclei of radioisotopes disintegrate at a specified decay rate, which, as should be expected, is the same for any monomolecular reaction and follows the exponential law (1) $N = N_o e^{-\lambda t}$ where N is the number of unchanged atoms at time t, $N_o$ is the number present at time t = o and $\lambda$ is the decay constant, characteristic of a particular radioisotope. This constant is, in reality, the fraction of the number of atoms transformed per unit time, provided the time unit is chosen short enough so that only a small fraction of the atoms transform in that interval.

It is more convenient to express the characteristic rate of radioactive decay in terms of half-life, $t_{1/2}$ which is the time required for an initial (large) number of atoms to be reduced to half that number by transformations. Thus, at time $t = t_{1/2}$ $N/N_o = 1/2$, and $t_{1/2} = \frac{0.693}{\lambda}$. Half-lives of radioisotopes can range from $4.5 \times 10^9$ years [for uranium —238 (U1)] to 0.019 seconds (for Radan 218). The situation may be further complicated by the fact that several decay products (daughter elements) in turn have a rate of decay, which may or may not be by the same disintegration process. Thus, the heavy naturally occurring species such as the uranium, radium and actimum series, the initial transformation can be followed by 12 successive disintegration patterns. Cobalt-60 with half-life of 5.3 years emits both gamma and beta radiations at the same decay rate.

Thus, the decay rate will have no influence on the measured ratio of the radiations. However, when interpreting results quantitatively in terms of a single type of radiation, i.e., gamma for volume of crack determi-

nations, corrections allowing for the rate of decay are applied. These correction factors are conveniently taken from the straight line plot on semi-log paper of log activity versus time.

## Terms of Radioactivity

*Millicurie:* Although millicurie was originally intended to describe the amount of radon in equilibrium with one mg of the parent substance, radium, it is presently referred to as that quantity of any radioisotope which undergoes the same number of disintegrations per second as 1 mg of pure radium, that is, $3.7 \times 10^7$.

*Rutherford:* Defined as that amount of a radioactive substance which undergoes one million disintegrations per second. As an illustration, we may calculate the weight in grams, W, of 1 millicurie of carbon-14 from its half-life of nearly 5000 years:

$$= \frac{0.693}{5000}\ \text{year}^{-1} = \frac{0.693}{5000 \times 365 \times 24 \times 60 \times 60}\ \text{sec}^{-1}$$

$$\frac{-dn}{dt} = N = \frac{w}{14} \times 6.02 \times 10^{23} = 1.9W \times 10^{17}\ \text{dis/sec}$$

$$\text{with } \frac{-dN}{dt} = 3.7 \times 10^7\ \text{dis/sec (1/mc)}$$

$$w = \frac{3.7 \times 10^7}{1.9 \times 10^{17}} = 2.0 \times 10^{-4}\text{g or } 0.2\text{ mg}$$

Thus, pure carbon-14 could be present in a specific activity of 5 mc per mg. Actually, this amount of specific activity is reduced by dilution with nonradioactive carbon-12 to a specific activity of 1 mc per mg or an isotopic ratio of

$$\frac{\text{C-12}}{\text{C-14}} = \frac{4}{1},$$

when ordered from the U. S. Atomic Energy Commission at Oak Ridge, Tenn.

*Roentgen:* "One roentgen unit is that quantity of X or gamma radiation such that the associated corpusculor emission per 0.001293 g of air (wt. of 1 cc of dry air at STP) produces, in air, ions carrying 1 e.s.u. quantity of electricity of either sign". This means that 1 roentgen (or r) produces $1.61 \times 10^{12}$ ion pairs per g of air which corresponds to the absorption of 83.8 ergs of energy per g of air. For radiation other than X or gamma, the term roentgen equivalent physical (r.e.p.) has been proposed to express ionization in tissues by other types of radiation; 83 ergs of energy dissipated per gram of tissue equals 1 r.e.p. of ionization. Usually, radiation dosage rates are of greater importance to personnel and so the terms roentgen per hour, or r/hr at 1 meter distance (r.h.m.), are used.

## Sensitivity of Detection

Measurements in the realm approaching the infinitesimal are possible only because of the extreme sensitivity of detection of radio elements. For example, the sensitivity of detection for cobalt-60 radiation (beta component) using a windowless flow counter of 50% efficiency, with an activity of 20 counts per minute above a background count of 20 counts per minute, may be calculated simply as follows:

1 mc $= 3.7 \times 10^7$ dis/sec $= 2.2 \times 10^9$ dis/min
1 dis/min $= 0.45 \times 10^{-9}$ mc
20 counts/min $= 20 \times 0.45 \times 10^{-9}$ mc $= 9 \times 10^{-9}$ mc

The quantity of radiochemical detectable

$$= \frac{9 \times 10^{-9}}{A},$$

where A = specific activity,

T or $Co^{60}$, A = 2000 mc/g or $\frac{Co^{60}}{Co^{59}} = \frac{1}{600}$,

$$\text{Detection limit} = \frac{9 \times 10^{-9}\text{mc}}{2000\ \text{mc/g}} = 4.5 \times 10^{-12}\text{g}$$

## Calculation of Radiation Dosage Rate

Gamma rays from 1 mc of $Co^{60}$:

1mc $= 3.7 \times 10^7$ dis/sec, but each disintegration gives rise to 2 gamma rays of 1.22 Mev $= 1.95 \times 10^{-6}$ ergs mean energy (av.).

Absorption coefficient ($\mu$) in air $= 6.4 \times 10^{-5}$ cm$^{-1}$ at a distance of 1 m

$$\frac{2 \times 3.7 \times 10^7}{4\pi \times 100 \times 100} = 5.89 \times 10^2\ \text{gamma rays impinge upon 1 cm}^2.$$

The number absorbed in 1 cm$^3$ is

$$(5.89 \times 10^2)\ (6.4 \times 10^{-5}) = 3.77 \times 10^{-2}\ \text{sec}^{-1}\ \text{cm}^{-3}.$$

The energy absorbed is

$$(3.77 \times 10^{-2})\ (1.95 \times 10^{-6}) = 7.35 \times 10^{-8}\ \text{erg/sec cm}^3.$$

The energy absorbed per gram of air is

$$\frac{7.35 \times 10^{-8}}{0.001293} = 5.68 \times 10^{-5}\ \text{erg/g sec},$$

which corresponds to

$$\frac{5.68 \times 10^{-5}}{83} = 6.87 \times 10^{-7}\ \text{r/sec}.$$

The dose received within one hour from the gamma radiation of 1 mc of $Co^{60}$ is thus

$6.87 \times 10^{-7} \times 3600 = 2.47 \times 10^{-3}$r $= 2.47$ m r at a distance of 1 meter.

Present dosage allowable is equal to

7.5 mr/hr for 8-hour working day or 0.3 r/wk.

Beta rays from 1 mc of phosphorus-32:

The average energy of the $P^{32}$ beta rays is 0.695 Mev, the upper limit 1.71 Mev corresponding to a range of about 800 mg/cm$^2$ in tissue. In a distance of 1 meter

$$\frac{3.7 \times 10^7}{4 \times 100 \times 100} = 2.95 \times 10^2\ \text{beta rays hit 1 cm}^2$$

with a total energy of

$$205\ \text{Mev} = 3.28 \times 10^{-4}\ \text{erg}.$$

This energy is dissipated in a layer of 800 mg/cm$^2$ thickness, resulting in an average energy dissipation of $4.1 \times 10^{-4}$ erg/g sec.

This is equivalent to:

$$\frac{4.1 \times 10^{-4}}{93} = 4.4 \times 10^{-6}\ \text{rep/sec}$$

(93 instead of 83 ergs is used for the beta radiation dose). The dose received within one hour is 16 in r.e.p. At an average distance of 10 m from the source, the dosage rate would be 1.6 r.e.p., considerable in excess of the 0.075 r.e.p. tolerance dose allowable for an 8-hour work day.

*(See Page 441 for Literature References)*

# Automatic Proportioning Cuts Mixing Costs By 58% at Harris Products Plant

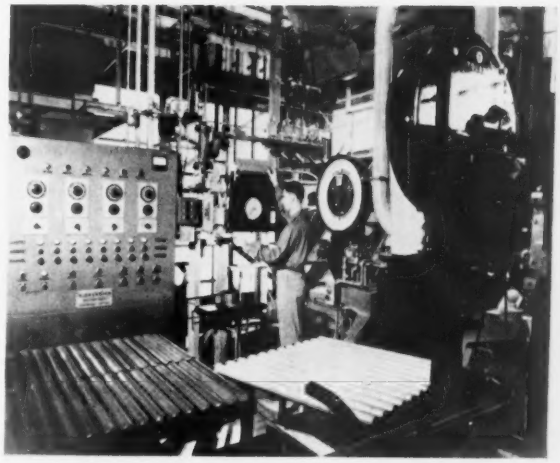
AUTOMATIC proportioning of carbon blacks is helping to cut mixing costs at a new $500,000 rubber mixing operation recently completed at Milan, Ohio, by the Harris Products Co., manufacturers of mechanical rubber goods. The company formerly supplied raw materials, rubber and chemicals to a custom mixer, and had the custom mixer make up finished slab stock. It is now mixing all its own stock. The result is a 58% reduction in mixing cost.

Unusual features of this $50,000 automatic proportioning system, which was engineered by the Richardson Scale Co., Clifton, N. J., are remote-control selecting of weights that make up a formula, and the cumulative weighing of ingredients in a single batching scale. Chief advantages of the system are precision weighing and absolute control over the weighing operations.

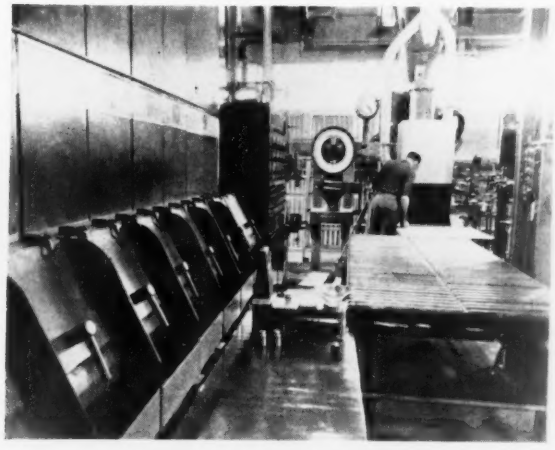
Built as an addition to the regular Harris Products processing plant, the new mixing room houses a 3A Uni-Drive Banbury mixer, scoop bins for storing pigments and accelerators, equipment for an oil-injection system, equipment for conveying and weighing slab stock, and the storage bins, conveyors and scale involved in the proportioning process.

In operation, slab stock is dropped into the Banbury manually; and the carbon blacks, automatically. At predetermined times during the mixing cycle the ram on the Banbury automatically raises and lowers. When raised, oil is injected into the mixer; accelerators and pigments are dropped in by hand.

Weights of different blacks desired for any mix are remotely selected on a panel control board. After that, the feeding from storage to the scale, the weighing and discharging from the scale proceed automatically. The process repeats itself as many times as need be.



*The control panel, heart of the carbon black proportioning system, is on the left in this view of the Harris plant. The conveyors in the foreground handle slab stock that is weighed on the adjacent scale and manually dropped into the Banbury. Progress of the mixing cycle is indicated on the controller in the center.*



*The scoop bins used for storing pigments and chemicals are clearly seen in this photograph. An operator goes from bin to bin with the tram car, weighing out necessary amounts for specific formulas. The scale dial in the background indicates weight of black in the weigh hopper of the Richardson automatic scale.*

Besides getting consistently high weighing accuracies, the new installation can turn out 20 batches per hour at 3-minute cycles. This includes a 28-second Banbury discharge time. Three things make this speed possible: (1) the automatic handling of blacks, (2) the operating technique practiced by Harris Products, and (3) the modern design of this Banbury mixer.

For the sake of accuracy, the screw-feeders delivering carbon black to the automatic scales are run at a slow speed. Scales are set to take up to 1½ minutes for a weighing.

Harris Products makes a complete line of rubber bushings, as well as Silentbloc, a patented assembly made up of a rubber part combined with metal either inside, outside, or both sides. These and other compression molded goods are made chiefly for the automotive industry.

For this type of product the company desires a finished rubber with high flex life, good abrasion resistance and ability to give high performance on deflection. To get these properties requires precise control, especially during the mixing cycle.

Special care must be taken and timing controlled, as the various additives enter a batch. Temperature, rotor clearance and good compound balance, too, directly affect quality. But by and large the quality is affected more by timing techniques and control of weights than any basic control in the mixing cycle. It is here, Harris Products believes, precise weighing and proportioning pays off.

In a mixing cycle, carbon black is screw-fed from in-

dividual bins to a receiving hopper on the automatic scale. This hopper is made of stainless steel and equipped with a vibrator to prevent material settling on the walls. The hopper also features access doors for easy cleaning. An air-operated, sealed radial gate on the scale discharges the blacks into the Banbury.

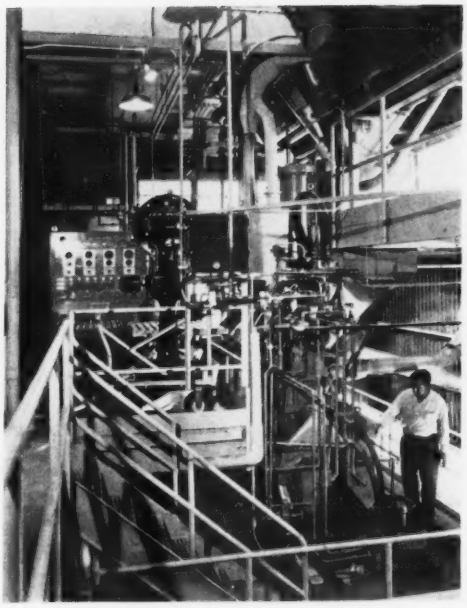
As the carbon black drops into the weigh hopper its weight is indicated on a large scale dial beside the control panel. When the selected weight is reached the dial triggers an electric mechanism, and the feeding stops. Another carbon black then is weighed until a correct amount is indicated. The process is automatically repeated until the formula is completed.

Progress of the weighing operation may be followed by observing lights on the panel. The control board also contains alarm signals. If anything should go wrong during proportioning, the system shuts down. The alarm lights inform the operator of the trouble and where it is located.

Scoop bins are located next to the control panel. An operator goes from bin to bin with a small hand truck weighing out these ingredients as a formula dictates.

Two men operate the system. One operates the small scale-car for weighing pigments (up to 14 types). He also weighs the slab rubber on a dial scale, which prints cumulative weights. The other man operates the control panel and the Banbury mixer. He also manually meters oils into the Banbury via pressurized discharge.

While eight carbon blacks, ranging from micron sizes to pelletized black, are used in the over-all operation, no more than four are used for any one formula. Consequently, the control panel is equipped with four weight selectors. Any one of the four can be used to select any of the eight blacks.



*Some of the equipment used for automatic proportioning at the Harris Products plant can be seen in this view of the mixing room. The carbon black is discharged into the Banbury directly from the scale, the stainless top hopper of which can be seen. The carbon black is discharged into this hopper by screw feeders.*

## Ladcote Compounds for the Extrusion Coating of Packaging Materials

NEW packaging applications are made possible by the development of compounds based on Bakelite polyethylene resins, designed for special applications that require only certain of the properties of Bakelite polyethylene. These compounds were developed by L. A. Dreyfus Company, South Plainfield, N. J., with the cooperation of the Bakelite Company, a Division of Union Carbide and Carbon Corporation. Known as Ladcote compounds, they are designed primarily for extrusion coating of packaging materials such as paper, board, foil and film.

One of the Ladcote compounds, a uniform blend of Bakelite polyethylene with 40 percent by weight of wax, is applied to kraft paper by the Lowe Paper Company of Ridgefield, N. J. Paper coated with this particular blend has a high order of resistance to water vapor transmission, lower cost, lower heat-sealing temperatures, higher gloss surface and improved release of packaged materials. It also has good tear strength and acts as a barrier to acids and alkalies. However, these coating compounds for paper have less elasticity and resistance to grease, scuffing and abrasion than paper coated with straight polyethylene.

Multiwall bags costing about 4 percent less than bags made of straight polyethylene-coated paper are fabricated by Arkell and Smiths, Canajoharie, N. Y., from Lowe's compound-coated paper. These papers are designed for packing a wide range of chemicals and foods, ranging from nitrate fertilizers, cements, plastic resins and quick-lime to powdered milk, brown sugar, bread and non-fat frozen foods. The compound-coated paper is also used for lining bottoms and walls of fiber drums in which chemicals are shipped.

Extrusion laminated between two fibrous sheets, one combination of polyethylene and wax acts as both an adhesive and an interply barrier. It does not interfere with conventional gluing and handling of paper and board products such as folding cartons, set-up boxes, textile wraps and multiwall bag linings, according to Lowe Paper. The sandwich type sheet is also recommended for wrapping material such as blueprint papers which are sensitive to both light and moisture.

The combined economy and effectiveness of this coating compound suggest possible uses on foil, film and paper pouches and packages holding liquid or dehydrated foods, sauces and beverages; on both woven and nonwoven textiles, from nursing mothers' pads to shipping tarpaulins, and on paper and board to package both moist and moisture-sensitive products.

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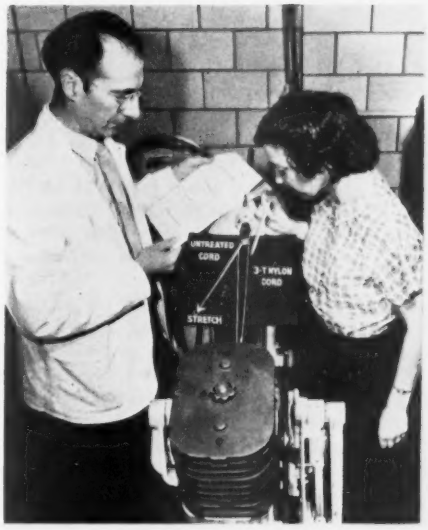
A new unit which is usable as an automatic temperature controller or excess temperature cut-off, or to verify temperatures of controllers in use, is being marketed by the Blue M Electric Co., Chicago 21, Ill. Called the **Safe-Temp Portable Electronic Controller-Indicator,** it will directly measure and control temperatures of ovens, furnaces, hot plates, liquid baths, and other related controlled equipment.

# Triple-Tempered Processed Nylon Tire Cord

PRELIMINARY data has been made available by the Goodyear Tire & Rubber Co. of Akron, Ohio, on its new triple-tempered processed nylon tire cord and some of the processes and equipment involved in its production. It has long been felt that nylon is the perfect tire cord if the stretch can be controlled. According to the company, a new way has been discovered to handle and process the fiber. The Goodyear method involves a chemical treatment of the nylon cord which is then put through a triple-action tempering process involving tension, temperature and time. The result is said to be the strongest, lightest weight and coolest running tire cord ever developed.

Dr. R. P. Dinsmore, vice-president in charge of research and development, relates that Goodyear threw all of its resources into this major development. When it was all added up, the "3-T" processed nylon represented an investment of $5,000,000 and 60,000 valuable man-hours of the best experts in their fields. Problems of nylon, such as the wild stretch which resulted in carcass growth, and inability of rubber to stick to it, had to be solved first in the research laboratory. This involved an extensive study of the fundamentals of adhesion, the invention of new adhesives and new concepts of processing operations.

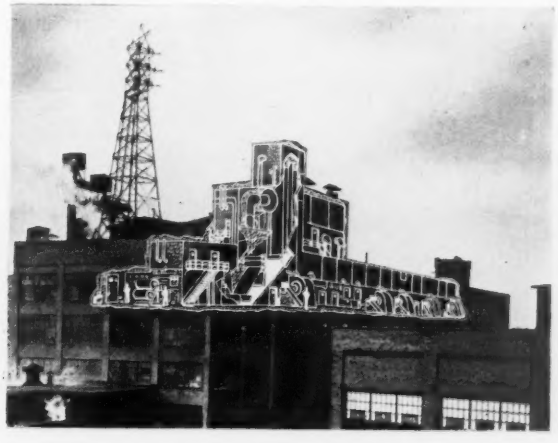
Twenty top researchers under G. D. Mallory, veteran Goodyear research engineer, spent five years working out the chemistry and mechanics of the new process. The next big hurdle was to translate these research findings into production and to develop machinery and equipment versatile enough to do the job. Philip W. Drew, manager of fabric design with 30 years of experience, headed up a six man committee of research, development and engineering leaders in 1950 to find the answers. This group began by developing a low stretch rayon to meet tougher service through pilot plant operations, then came up with a revolutionary high tension cord stretching machine capable of handling any fabric. This new equipment, known as the Goodyear-designed Ross-Waldron unit, has made possible mass production of the new 3-T processed nylon tire fabric.



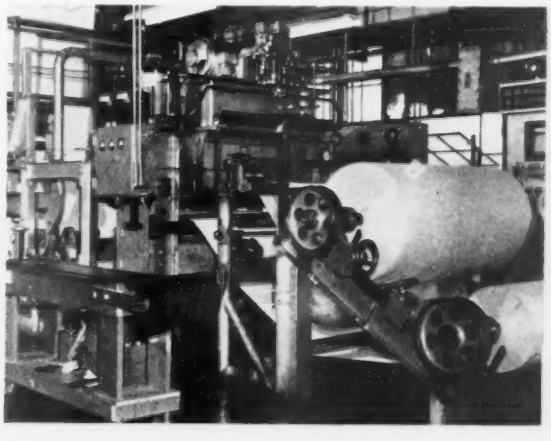

*Goodyear's 3-T processed synthetic nylon tire cord wins a "tug-of-war" stretch test with untreated nylon cord. The two cords were tied together at the center of a pulley and a weight load applied.*

Two of these giant machines, costing more than $1,000,000 each, are now processing hundreds of yards of Goodyear's new nylon fabric every minute at Akron, Ohio, and Cartersville, Ga. A third unit will soon be in operation at Rockmart, Georgia.

The company states that each installation is a complete operation, a new factory in itself. New buildings had to be constructed at Cartersville and Rockmart to house the machines and 120,000 gallon latex storage tanks were installed at these cities and in Akron. The Akron machine is 60 feet high and winds down from



*Sketch of the four-story high, million dollar machine bursting through the roof of Goodyear's Plant 1 in Akron. This machine made possible the mass production of the new 3-T nylon tire cord.*



*Close-up view of the high tension cord stretching machine showing untreated fabric entering the unit. Two of these machines are now operating, with a third scheduled to go into operation shortly.*

the seventh floor of Plant 1, where untreated fabric enters the machine, to the fourth floor output of the 3-T processed cord. A third of a mile of fabric is stretched under tons of tension in a single operation. Occupying an area 150 feet long, the machine is capable of putting out 100,000 yards of fabric a day for both rayon and nylon tires.

In the Akron installation, an inter-com system is used to relay orders between floors and traffic signal lights and horns provide safeguards. According to M. H. Kilgore, assistant manager of engineering, 20,000 square feet of concrete flooring was installed in Plant 1 to replace wood which cannot stand the heat and moisture. It took two months and 15,000 man-hours for a crew of 30 mechanics to install the unit, which went into operation last August. Railroad sidings and trucking platforms at the machine sites bring in carloads of fabrics, latex and chemicals.

Goodyear states that some of the important improvements in fabric treatment made possible by the new units are: (1) Tension increased up to many times normal practice; (2) Higher treatment temperatures to allow faster and more efficient drying; (3) Tower drying to replace water-cooled rolls and eliminate water dripping on treated fabric, and (4) Automatic tension and stretch controls operated by completely electronic instruments.

A large number of road tests show that cord fabric treated by the triple tempering process reduces tire growth and tread cracking, increases tread mileage and bruise resistance, and is more heat resistant. In one laboratory test, 3-T processed nylon tire cord was reported to be an easy winner in a "tug-of-war" stretch contest with untreated nylon. Tires constructed with the new cord have been rammed against a curb at 55 miles an hour, and not a cord was broken. One tire test

*The beginning of Goodyear's exclusive triple tempering process to lick growth in nylon tire cord is seen here. One-third of a mile of 3-T processed nylon fabric is stretched under tons of tension.*

was run at 100 miles an hour for five minutes and fast braked until the outside temperature was hot enough to fry an egg, yet the cord lived through the ordeal.

Dr. Dinsmore summed it up in this way: "We have improved our basic fabric rayon by this high tension tempering, and now we have extended this development to the control of our newest and most desirable fabric —Goodyear processed nylon. It marks mastery of methods to produce synthetic fibers that will give even better results than those possible with the natural fibers of cotton and rayon."

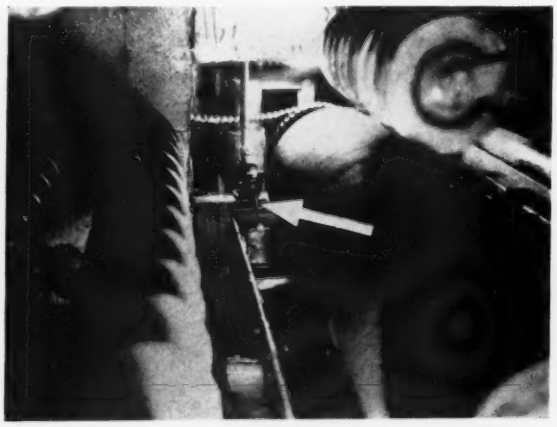
## Electronic Instrument Controls Adhesives in Bonding Operation

ELECTRONICALLY-operated level controls are now used to insure proper adhesives coating in bonding operations at the Topeka, Kansas, plant of the Goodyear Tire and Rubber Company. Through the use of Tektors, manufactured by the Fielden Instrument Division of Robertshaw-Fulton Controls Company, Philadelphia, Penna., it is now possible to control a critical level of rubber cement in a shallow container, which supplies the adhesive to tread material for bonding to tire carcasses.

According to the company, a roller similar to those used in printing presses picks up from the cement container the proper amount of adhesive needed, and in turn deposits it on the moving band of tread material. Exact amounts of adhesive are important to insure a perfect bond between tread stock and tire carcass, a definite quality factor in tire performance.

The Goodyear plant is now using a substantial number of Tektors, which contain no moving parts that can clog or foul, and do not depend on floats or electrical conductivity for accurate performance. Too much adhesive, it was stated, would also cause some spillage thereby creating a fire hazard in the plant.

Tektor instruments, which are used also for controlling levels of granular or powdered substances, mineral aggregates, corrosive chemicals, acids, soot, paint, etc., operate on 115 volts, 60 cycles and are not affected by wide voltage variations.



*The Tektor electronically-operated level control used at Goodyear's Topeka plant for bonding operations is depicted by the arrow in the above photograph.*

# The Compounding of Colored Butyl Rubber Goods

By RALPH F. WOLF

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THERE is a dearth of information in the rubber literature concerning light colored Butyl rubber compounds and no advice at all about preventing the bloom of sulfur from such stocks. The most recent publication on the subject of non-black Butyl *(1)* was merely a compilation and review of information published up to early 1951 and contained no new information previously unpublished. In fact, the most recent information included was that developed in this laboratory in regard to Hi-Sil 101 (formerly called Hi-Sil) and published in February, 1951 *(2)*.

Since the publication of this last article, work with Hi-Sil 202 (formerly Hi-Sil C) in Butyl rubber has antiquated all previous information on the compounding of colored Butyl rubber goods. This has happened because Hi-Sil 202 is a much better reinforcing pigment than Hi-Sil 101 for Butyl rubber. This fact was shown in a bulletin *(3)* issued by this laboratory in March, 1953. For convenience, the comparison made between Hi-Sil 101 and Hi-Sil 202 at that time is given in Table I.

Recently, automobile manufacturers have expressed great interest in colored Butyl rubber products. The automobile companies have for a long time wanted bright colors in channel strip, grommets, pedal pads, and other molded and extruded parts. Although black parts give excellent service they add nothing to sales appeal when new and soon become even shabbier looking. Detroit's style-conscious designers have long regarded visible black rubber parts with displeasure. Evidence of this is seen in the efforts, only partially successful, to hide black rubber beneath chrome strips or to coat it with colored lacquer.

Determined efforts have also been made to use the thermoplastics which combine the desirable properties of bright color with excellent resistance to weathering and aging. These attempts have been defeated for the most part by certain other undesirable characteristics of these materials, such as poor resilience and set and excessive cold flow.

It is true that colored parts have been made out of natural rubber and GR-S to some extent. But, due to the fact that non-staining antioxidants do not generally impart the protection that can be obtained from the types of antioxidants used in black parts, the resistance to weathering and aging of colored parts made from Hevea or GR-S has not been good enough.

Butyl rubber is an ideal material for use in exposed automotive parts. Although not very resilient when compared with natural rubber at ordinary temperature, it is far better than the thermoplastics in this respect. At the same time, its aging resistance is far better than that of colored Hevea or GR-S compounds and its cost is lower than that of other synthetics having satisfactory aging properties. Because Butyl combines the good characteristics obtainable in thermoplastics, natural rubber, and GR-S, the automobile manufacturers have long had it in mind.

Until fairly recently it has been true that Butyl rubber parts could be made available in any color as long as it was black. Before Hi-Sil 101 came on the market it was not possible to make satisfactory, colored Butyl compounds with good physical properties. Now, with Hi-Sil 202, it is possible to make white or colored compounds with properties as good as those obtainable with the blacks commonly used in Butyl.

The renewed interest of the automobile companies in colored Butyl has been reflected in the many inquiries from rubber companies manufacturing automotive parts for information about the use of Hi-Sil 202. As a consequence, this laboratory undertook and has just completed a more extensive investigation of the use of this reinforcing silica in Butyl.

One of the most important results of this work was the development of a means for obtaining excellent sulfur cures without any subsequent sulfur bloom. This method is applicable to black stocks, such as those used for inner tubes, as well as to colored Butyl compounds. It has not been suggested previously and the author believes it to be the most practical method evolved to date to eliminate the disfiguring, dusty, gray appearance of cured Butyl articles.

The prevention of blooming is accomplished by using a combination of elemental sulfur and an organic sulfide. The amount of elemental sulfur is less than that which will bloom and is not sufficient to give a good cure. Additional sulfur, in non-blooming form, is provided by use of a material such as Sulfasan R (4,4′ dithiodimorpholine). More information about this type of cure is given later in this paper in the section on vulcanizing agents.

TABLE I—COMPARISON OF HI-SIL 101 AND HI-SIL 202 IN BUTYL RUBBER

Formula

| | |
|---|---|
| GR-I-15 | 100.0 |
| Pigment | 39.0 |
| Zinc Oxide | 5.0 |
| Tellurac | 1.0 |
| Zenite | 1.0 |
| Sulfur | 2.0 |
| Diethylene Glycol | 2.5 |
| BxDC | 1.0 |

| Pigment | Cure at 307° F. (Mins.) | Modulus 300% | Modulus 500% | Tens. | Elong. | Duro. Hard. 0″ | Duro. Hard. 30″ | Crescent Tear (lbs./in.) |
|---|---|---|---|---|---|---|---|---|
| Hi-Sil 101 (Hi-Sil) | 10 | 170 | 440 | 1960 | 850 | 44 | 35 | 210 |
| | 15 | 210 | 530 | 2130 | 810 | 47 | 38 | 190 |
| | 20 | 260 | 640 | 2230 | 780 | 47 | 39 | 150 |
| | 30 | 300 | 780 | 2110 | 730 | 48 | 42 | 160 |
| Hi-Sil 202 (Hi-Sil C) | 10 | 100 | 340 | 2310 | 940 | 47 | 38 | 310 |
| | 15 | 170 | 450 | 2570 | 880 | 48 | 39 | 250 |
| | 20 | 200 | 530 | 2680 | 860 | 50 | 42 | 260 |
| | 30 | 240 | 610 | 2710 | 810 | 52 | 44 | 240 |

TABLE II—COMPARATIVE EXTRUDABILITY OF SEVERAL HI-SIL 202 COMPOUNDS

| | Formulae | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| GR-I-15 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Hi-Sil 202 | 39.0 | 58.5 | 40.0 | 39.0 | 58.5 | 40.0 |
| Calcene NC | —— | —— | 40.0 | —— | —— | 40.0 |
| Soft Clay | —— | —— | 40.0 | —— | —— | 40.0 |
| Zinc Oxide | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| TMTDS | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Sulfur | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Paraffin | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Diethylene Glycol | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| BxDC | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Petrolatum | —— | —— | —— | 5.0 | 5.0 | 5.0 |

Extrusion Rates

| Compound | Mooney Plast. (ML' 4 at 212° F.) | Inches per Min. | Diameter | Remarks |
|---|---|---|---|---|
| 1 | 101 | 21.7 | 16/32 | Rough. Spider marks. |
| 2 | 170 | 37.9 | 13/32 | Smooth. |
| 3 | 157 | 40.0 | 13/32 | Smooth. |
| 4 | 78 | 25.0 | 17/32 | Rough. Better than 1. |
| 5 | 137 | 46.0 | 14/32 | Smooth. |
| 6 | 123 | 46.0 | 13/32 | Smooth. |

Physical Properties

| Comp. | Cure at 320° F. (Mins.) | Modulus 300% | Modulus 500% | Tens. | Elong. | Duro. Hard. 0" | Duro. Hard. 30" | Crescent Tear (lbs./in.) |
|---|---|---|---|---|---|---|---|---|
| 1 | 7.5 | 230 | 470 | 2370 | 950 | 52 | 41 | 380 |
| | 10 | 280 | 440 | 2600 | 900 | 54 | 44 | 360 |
| | 15 | 260 | 530 | 2650 | 860 | 56 | 46 | 260 |
| | 20 | 300 | 620 | 2570 | 790 | 56 | 46 | 230 |
| | 30 | 330 | 770 | 2410 | 720 | 56 | 47 | 200 |
| 2 | 7.5 | 210 | 370 | 1620 | 920 | 70 | 55 | 330 |
| | 10 | 210 | 540 | 1910 | 860 | 70 | 57 | 330 |
| | 15 | 260 | 680 | 2080 | 830 | 72 | 61 | 780 |
| | 20 | 280 | 750 | 2080 | 800 | 72 | 60 | 360 |
| | 30 | 360 | 960 | 2060 | 720 | 71 | 61 | 280 |
| 3 | 7.5 | 270 | 620 | 1670 | 760 | 65 | 51 | 270 |
| | 10 | 280 | 660 | 1660 | 755 | 64 | 49 | 255 |
| | 15 | 320 | 795 | 1695 | 710 | 67 | 54 | 260 |
| | 20 | 305 | 820 | 1745 | 675 | 71 | 56 | 250 |
| | 30 | 385 | 990 | 1680 | 660 | 71 | 58 | 240 |
| 4 | 7.5 | 130 | 360 | 2650 | 920 | 52 | 37 | 260 |
| | 10 | 170 | 380 | 2670 | 900 | 58 | 39 | 250 |
| | 15 | 180 | 510 | 2620 | 830 | 58 | 40 | 220 |
| | 20 | 240 | 570 | 2600 | 800 | 57 | 42 | 220 |
| | 30 | 210 | 710 | 2610 | 760 | 61 | 44 | 190 |
| 5 | 7.5 | 140 | 370 | 2080 | 940 | 72 | 54 | 360 |
| | 10 | 170 | 370 | 1940 | 900 | 72 | 52 | 360 |
| | 15 | 210 | 530 | 2140 | 870 | 72 | 55 | 330 |
| | 20 | 210 | 550 | 2170 | 830 | 72 | 55 | 350 |
| | 30 | 240 | 640 | 2170 | 800 | 72 | 57 | 330 |
| 6 | 7.5 | 230 | 540 | 1670 | 790 | 68 | 50 | 270 |
| | 10 | 230 | 580 | 1670 | 770 | 72 | 51 | 270 |
| | 15 | 300 | 700 | 1620 | 700 | 72 | 54 | 240 |
| | 20 | 300 | 790 | 1670 | 690 | 69 | 55 | 230 |
| | 30 | 330 | 850 | 1480 | 630 | 72 | 57 | 210 |

## PROCESSING

### Mixing

Hi-Sil 202 mixes readily into Butyl rubber. It disperses well, using standard mixing methods for Butyl and there are few, if any, visible specks or agglomerates in the resulting compound. Therefore, in the mixing of Butyl stocks containing Hi-Sil 202 it is suggested that each plant follow the same procedure it uses in mixing black stocks.

Hi-Sil 202-loaded Butyl compounds will stick to mill rolls although to a lesser extent than do stocks containing Silene EF or some of the other mineral fillers. The sticking tendency can be entirely prevented by use of about 1 PHR of BxDC (butoxyethyl diglycol carbonate) *(4)* on the Butyl. Depending on the factory equipment involved and the cooling water available, it is possible that the amount of BxDC required can be reduced to 0.75 PHR. Even 2 or 3 PHR will not interfere with subsequent steps in stock preparation, such as plying or splicing.

Some study has been made of high temperature mixing. Batches made by mixing Hi-Sil 202 and Butyl at 375°F. for 15 minutes and then allowing this masterbatch to rest for 24 hours before completing the mix had very slightly higher hardnesses and somewhat higher moduli than normally mixed batches. Use of p-dinitroso benzene (Polyac) in the high temperature mix resulted in a further slight modulus increase. These effects do not appear to be of sufficient importance in applications to which colored Butyl will be put to justify recommendation of this mixing procedure.

### Extrusion

Butyl rubber molds very readily regardless of loading. The compounder developing a stock for use in production of molded parts can, therefore, use either low or high loadings of fillers as he chooses. His choice will be based more on properties desired and permissible compound cost rather than on processability.

The compounder developing a stock for an extruded part faces another problem. Because of Butyl's inherent nerve, which is unaffected by milling, it is virtually impossible to extrude a pure gum Butyl compound.

Twenty volumes (39 PHR) of Hi-Sil 202 is not sufficient to produce an extrudable Butyl stock. Increasing the Hi-Sil 202 loading to 30 volumes (58.5 PHR) produces a stock that extrudes smoothly and without swell. Addition of pigments that do not reinforce Butyl, such as soft clay and Calcene NC, to a 40 PHR Hi-Sil 202 compound also produces a smooth, non-swelling stock.

Three parts of petrolatum were added to each of the first three compounds shown in Table II without obtaining any noticeable increase in tubing speed. Addition of five parts of petrolatum increased tubing speed 15 to 21 percent. The effect of adding 5 parts of stearic acid or 5 parts of aluminum stearate was also tested. Neither of these lubricants increased the rate of extrusion as much as petrolatum did under the conditions used. As both are much more expensive than petrolatum, no further work was done with them.

The principal effect of 5 PHR of petrolatum on physical properties of Hi-Sil 202-loaded compounds is to reduce modulus. Elongation is increased slightly. Tensile strength and hardness are not much affected.

The results shown in Table II were obtained using a No. ½ Royle extruder with a round die 12/32-inch in diameter. Screw speed was 75 r.p.m., temperature of the die was 300°F., and the barrel and screw were kept cold.

## COMPOUNDING

### Effect of Glycol on Hi-Sil 202 Compounds

Hi-Sil 202 has a higher surface area than Hi-Sil 101. Perhaps due to this, or perhaps due to some other factor, diethylene glycol has a much greater effect on Hi-Sil 202-loaded Butyl compounds than it has on those containing Hi-Sil 101.

Diethylene glycol markedly speeds up the rate of cure of Butyl compounds loaded with Hi-Sil 202. This has been observed in a Tellurac-Zenite accelerated compound cured at 307°F. It has been confirmed in TMTDS-accelerated compounds cured at 320°F. The results of both sets of tests are shown in Table III.

It will be noted that the Tellurac-Zenite compound which did not contain glycol was not cured in 60 minutes. Addition of 2.5 parts glycol increased the rate of cure, gave higher modulus, lower elongation and better tensile. In the latter experiments with a 2 PHR TMTDS-accelerated stock containing 20 volumes of Hi-Sil 202, diethylene glycol was added in 0.5 part increments. Again, glycol speeded the rate of cure, and increased

TABLE III—EFFECT OF DIETHYLENE GLYCOL ON HI-SIL 202-LOADED GR-I COMPOUNDS

| | Formulae | | | | | | |
|---|---|---|---|---|---|---|---|
| | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| GR-I-15 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Hi-Sil 202 | 39.0 | 39.0 | 39.0 | 39.0 | 39.0 | 39.0 | 39.0 |
| Zinc Oxide | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Tellurac | 1.0 | 1.0 | — | — | — | — | — |
| Zenite | 1.0 | 1.0 | — | — | — | — | — |
| TMTDS | — | — | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Sulfur | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Paraffin | — | — | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| Diethylene Glycol | — | 2.5 | — | 0.5 | 1.0 | 1.5 | 2.5 |
| BxDC | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

| Compound | Acceleration | Cure (Mins.) | Modulus 300% | Modulus 500% | Tens. | Elong. | Duro. Hard. 0" | Duro. Hard. 30" | Crescent Tear (lbs./in.) |
|---|---|---|---|---|---|---|---|---|---|
| 7 | Tellurac 1 | 10 x 307° F. | 90 | 210 | 1660 | 1070 | 49 | 38 | 240 |
| | Zenite 1 | 15 | 130 | 260 | 1970 | 1020 | 51 | 40 | 250 |
| | Glycol 0 | 20 | 140 | 310 | 2240 | 1020 | 52 | 41 | 280 |
| | | 30 | 170 | 440 | 2350 | 920 | 53 | 43 | 270 |
| | | 60 | 210 | 600 | 2510 | 850 | 55 | 47 | 230 |
| 8 | Tellurac 1 | 10 x 307° F. | 100 | 340 | 2310 | 940 | 47 | 38 | 310 |
| | Zenite 1 | 15 | 170 | 450 | 2570 | 880 | 48 | 39 | 250 |
| | Glycol 2.5 | 20 | 200 | 530 | 2680 | 860 | 50 | 42 | 260 |
| | | 30 | 240 | 610 | 2710 | 810 | 52 | 44 | 240 |
| | | 60 | 330 | 980 | 2300 | 670 | 53 | 47 | 170 |
| 9 | TMTDS 2 | 7.5 x 320° F. | 160 | 330 | 2110 | 1000 | 60 | 42 | 300 |
| | Glycol 0 | 10 | 170 | 340 | 2310 | 950 | 62 | 45 | 280 |
| | | 15 | 180 | 470 | 2500 | 880 | 62 | 46 | 270 |
| | | 20 | 230 | 610 | 2540 | 840 | 62 | 48 | 270 |
| | | 30 | 260 | 620 | 2670 | 810 | 63 | 49 | 220 |
| 10 | TMTDS 2 | 7.5 x 320° F. | 110 | 300 | 2180 | 1020 | 59 | 40 | 300 |
| | Glycol 0.5 | 10 | 130 | 330 | 2380 | 970 | 62 | 45 | 310 |
| | | 15 | 230 | 440 | 2640 | 910 | 62 | 46 | 270 |
| | | 20 | 230 | 530 | 2650 | 860 | 62 | 47 | 270 |
| | | 30 | 260 | 680 | 2600 | 800 | 63 | 50 | 260 |
| 11 | TMTDS 2 | 7.5 x 320° F. | 100 | 240 | 2170 | 1000 | 58 | 40 | 300 |
| | Glycol 1 | 10 | 130 | 310 | 2410 | 960 | 57 | 42 | 320 |
| | | 15 | 200 | 440 | 2650 | 900 | 62 | 45 | 280 |
| | | 20 | 180 | 500 | 2620 | 850 | 62 | 46 | 270 |
| | | 30 | 240 | 640 | 2580 | 800 | 61 | 47 | 260 |
| 12 | TMTDS 2 | 7.5 x 320° F. | 110 | 330 | 2430 | 990 | 57 | 41 | 340 |
| | Glycol 1.5 | 10 | 180 | 410 | 2440 | 870 | 57 | 41 | 330 |
| | | 15 | 200 | 480 | 2580 | 850 | 59 | 44 | 300 |
| | | 20 | 240 | 620 | 2620 | 800 | 58 | 45 | 290 |
| | | 30 | 240 | 700 | 2580 | 760 | 58 | 48 | 240 |
| 13 | TMTDS 2 | 7.5 x 320° F. | 130 | 330 | 2450 | 960 | 57 | 42 | 320 |
| | Glycol 2.5 | 10 | 170 | 370 | 2620 | 910 | 58 | 43 | 270 |
| | | 15 | 180 | 470 | 2710 | 850 | 58 | 45 | 240 |
| | | 20 | 230 | 550 | 2670 | 820 | 62 | 46 | 230 |
| | | 30 | 240 | 700 | 2510 | 760 | 62 | 48 | 210 |

modulus and tensile slightly. Addition of 1.5 PHR of glycol appeared to be sufficient as there was little change after this point and stocks containing 1.5 or 2.5 PHR of glycol were quite similar.

## Use of Paraffin

Due to the nature of the polymer, press-cured Butyl rubber parts have a slightly tacky surface after vulcanization even though they are well cured. Parts will stick to each other and this may cause distortion if the pieces are not packed carefully for shipment. The sticky surface also is difficult to keep clean.

Surface tack of cured Butyl is easily prevented by inclusion of a small amount of paraffin in the compound. The manner in which paraffin blooms from Butyl rubber is different from the way in which it blooms out of natural rubber. A paraffin bloom on natural rubber is a hard, brittle film which cracks and peels off as soon as the rubber is bent. A paraffin bloom on Butyl is a soft, flexible film having fair adhesion to the rubber. This difference probably results from the difference in the solubility of paraffin in the two polymers.

A recommendation of the producer of Butyl rubber that three to five parts of paraffin be included in mechanical goods compounds does not appear to be based on any factory experience with Butyl molded goods. Such amounts of paraffin produce an excessively heavy bloom, thick enough to permit wax to be scraped from the surface. This results in a dull surface that cannot be polished.

It has been found in this laboratory that about 0.75 PHR of paraffin is ample to destroy surface tack after cure and leave only a barely noticeable film on the rubber. Any larger amount of paraffin is not desirable, while a lesser amount, such as 0.5 part, leaves some residual tack.

## Acceleration

An extensive comparison of thiuram and dithiocarbamate ultra-accelerators singly and in various combinations was made in this laboratory as part of the initial investigation of the use of Hi-Sil 101 in Butyl rubber. The results were published in the article (*2*) previously cited.

The similarity of Hi-Sil 202 to Hi-Sil 101 made it appear unnecessary to repeat all of this work at the present time. Because of its greater surface area, it is perhaps a little more difficult to cure Hi-Sil 202 than 101 in Butyl. Accelerations that are not sufficiently fast or are otherwise unsatisfactory for Hi-Sil 101 would not be expected to be satisfactory for Hi-Sil 202. Only those that were among the best for 101 needed to be tested for Hi-Sil 202.

Reference to the previous work on Hi-Sil 101 will show that 2 PHR of TMTDS or Tellurac, or a combination of 1 PHR Tellurac with 1 PHR of Zenite, gave the best results. The distinct discoloration which results from use of 2 PHR of Tellurac was deemed undesirable in compounds that might be used for white or pastel articles. Consequently, the only accelerations

TABLE IV—COMPARISON OF TMTDS AND TELLURAC-ZENITE ACCELERATIONS FOR HI-SIL 202-LOADED BUTYL COMPOUNDS

| Formulae | 14 | 15 |
|---|---|---|
| GR-I-15 | 100.0 | 100.0 |
| Hi-Sil 202 | 39.0 | 39.0 |
| Zinc Oxide | 5.0 | 5.0 |
| Titanium Dioxide | 3.0 | 3.0 |
| TMTDS | 2.0 | — |
| Tellurac | — | 1.0 |
| Zenite | — | 1.0 |
| Sulfur | 2.0 | 2.0 |
| Diethylene Glycol | 2.5 | 2.5 |
| Paraffin | 1.0 | 1.0 |
| BxDC | 1.0 | 1.0 |

| Comp. | Cure at 320° F. (Mins.) | Modulus 300% | 500% | Tens. | Elong. | Duro. Hard. 0″ | 30″ | Crescent Tear (lbs./in.) |
|---|---|---|---|---|---|---|---|---|
| 14 | 7.5 | 195 | 395 | 2410 | 940 | 51 | 40 | 330 |
| | 10 | 210 | 425 | 2520 | 875 | 53 | 43 | 330 |
| | 15 | 230 | 525 | 2570 | 830 | 55 | 46 | 260 |
| | 20 | 255 | 580 | 2500 | 790 | 55 | 46 | 260 |
| | 30 | 300 | 775 | 2415 | 725 | 56 | 47 | 225 |
| 15 | 7.5 | 160 | 330 | 2160 | 960 | 52 | 41 | 330 |
| | 10 | 170 | 360 | 2400 | 920 | 53 | 42 | 320 |
| | 15 | 200 | 440 | 2520 | 900 | 56 | 45 | 290 |
| | 20 | 230 | 530 | 2450 | 840 | 56 | 46 | 260 |
| | 30 | 270 | 620 | 2510 | 800 | 57 | 48 | 240 |

studied extensively in the present work on Hi-Sil 202 were 2 PHR of TMTDS and the combination of 1 PHR Tellurac with 1 PHR Zenite. TMTDS has no effect at all on the color of the base stock. The Tellurac-Zenite combination does give a bluish-gray hue which would have to be taken into consideration in white stocks and in some pastels.

Both of these accelerations give excellent cures as shown in Table IV. The choice between them depends upon other considerations than speed of cure. No color is imparted to the stock by 2 PHR of TMTDS but this acceleration is somewhat more expensive than 1 PHR Tellurac plus 1 PHR of Zenite. Therefore, where a white or very light pastel other than gray or blue is involved, the choice should be TMTDS. In grays, blues or any mass tones, the Tellurac-Zenite combination can be used satisfactorily and a slight cost saving obtained.

It will be noted that the compounds in Table IV contain 2 PHR of sulfur. This amount of sulfur will bloom and consequently neither of these compounds would be recommended, as they stand, for production of colored Butyl goods. With either acceleration, bloom can be reduced by reducing sulfur or eliminated by using a sulfur-Sulfasan R combination as shown in the section on vulcanizing agents.

## Vulcanizing Agents

For almost all articles except curing bags, Butyl rubber is generally vulcanized with two parts of elemental sulfur for each 100 parts of rubber hydrocarbon. Theoretically, only a fraction of this amount of sulfur is needed because of the high degree of saturation of Butyl but, in practice, good vulcanizates are not obtained with elemental sulfur unless at least 1.5 parts or, more generally, 2 parts of sulfur are used. Table V shows results obtained with 2 PHR of TMTDS at sulfur levels of 2, 1.5 and 1 PHR. These results indicate that adequate cure can not be expected if sulfur is decreased much below 1.5 PHR because modulus is decreasing and permanent set increasing.

Since 2 PHR of sulfur is greatly in excess of that which reacts with the double bonds in Butyl, the excess migrates to the surface of the vulcanized article where it appears as a gray bloom. Decreasing sulfur to 1.5 PHR does not improve this condition very much as considerable bloom still appears. Sulfur bloom on Butyl goods has not been particularly objectionable up to the present time as almost all of this type of rubber has been consumed in the manufacture of black automobile tire inner tubes. Black inner tubes, even when they are seen by the consumer, have little aesthetic appeal at best and sulfur bloom consequently is not detrimental. On the other hand, it is easy to see why a sulfur bloom would be highly objectionable on colored goods which are being sold and used on the strength of their attractive appearance.

In one of the first attempts to get rid of this unsightly bloom which marred the surface appearance of a maroon colored Butyl grommet, insoluble sulfur was substituted for regular rubbermaker's sulfur in the base compound. As shown in Table V, there was little difference in cured properties. Unfortunately, there was also no difference in the amount of bloom.

An attempt was made to use combinations of elemental sulfur with other vulcanizing agents such as elemental selenium and tellurium. Both of the latter bloom when used in sufficient quantity to cure Butyl by themselves just as sulfur does. It was thought that a sulfur-selenium combination containing an amount of each material which was below its individual blooming point might still give a good cure.

A Butyl compound vulcanized with a combination of 1 part sulfur with 1 part selenium (Vandex) had physical properties about equal to those obtained with 2 PHR of sulfur. This is shown by comparing Compounds 16

TABLE V—EFFECT OF AMOUNT AND TYPE OF SULFUR ON PROPERTIES OF TMTDS-ACCELERATED BUTYL COMPOUNDS

| Formulae | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|
| GR-I-15 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Hi-Sil 202 | 39.0 | 39.0 | 39.0 | 39.0 | 39.0 | 39.0 |
| Zinc Oxide | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| TMTDS | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Sulfur | 2.0 | 1.5 | 1.0 | — | — | 1.0 |
| Insoluble Sulfur | — | — | — | 2.0 | 1.5 | — |
| Vandex | — | — | — | — | — | 1.0 |
| Diethylene Glycol | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Paraffin | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| BxDC | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

| Comp. | Cure at 320° F. (Mins.) | Modulus 300% | 500% | Tens. | Elong. | Duro. Hard. 0″ | 30″ | Crescent Tear (lbs./in.) | Perm. Set | Bloom |
|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 7.5 | 230 | 470 | 2370 | 950 | 52 | 41 | 380 | | |
| | 10 | 280 | 440 | 2600 | 900 | 54 | 44 | 360 | | |
| | 15 | 260 | 530 | 2650 | 860 | 56 | 46 | 260 | | |
| | 20 | 300 | 620 | 2570 | 790 | 56 | 46 | 230 | 36 | Heavy |
| | 30 | 330 | 770 | 2410 | 720 | 56 | 47 | 200 | | |
| 17 | 7.5 | 170 | 340 | 2370 | 980 | 52 | 40 | 310 | | |
| | 10 | 210 | 410 | 2470 | 910 | 52 | 40 | 270 | | |
| | 15 | 270 | 510 | 2720 | 880 | 55 | 45 | 250 | | |
| | 20 | 270 | 640 | 2780 | 820 | 55 | 45 | 240 | 38 | Distinct |
| | 30 | 300 | 720 | 2510 | 760 | 56 | 48 | 200 | | |
| 18 | 7.5 | 130 | 300 | 2410 | 990 | 53 | 42 | 360 | | |
| | 10 | 170 | 400 | 2600 | 890 | 56 | 45 | 320 | | |
| | 15 | 200 | 510 | 2600 | 850 | 57 | 46 | 380 | | |
| | 20 | 240 | 530 | 2480 | 810 | 58 | 49 | 260 | 39 | None |
| | 30 | 260 | 610 | 2450 | 770 | 56 | 48 | 250 | | |
| 19 | 7.5 | 140 | 340 | 2540 | 910 | 59 | 42 | 310 | | |
| | 10 | 170 | 380 | 2600 | 920 | 57 | 42 | 210 | | |
| | 15 | 180 | 480 | 2500 | 820 | 58 | 44 | 290 | | |
| | 20 | 230 | 570 | 2600 | 810 | 59 | 46 | 260 | | Heavy |
| | 30 | 240 | 670 | 2470 | 740 | 59 | 47 | 250 | | |
| 20 | 7.5 | 160 | 340 | 2520 | 910 | 57 | 42 | 340 | | |
| | 10 | 140 | 370 | 2520 | 900 | 57 | 42 | 270 | | |
| | 15 | 180 | 440 | 2600 | 850 | 59 | 45 | 280 | | |
| | 20 | 240 | 540 | 2550 | 810 | 61 | 46 | 240 | | Distinct |
| | 30 | 260 | 680 | 2510 | 740 | 61 | 48 | 210 | | |
| 21 | 7.5 | 140 | 325 | 2425 | 920 | 56 | 41 | 340 | | |
| | 10 | 170 | 395 | 2495 | 895 | 57 | 41 | 300 | | |
| | 15 | 185 | 460 | 2515 | 850 | 57 | 44 | 275 | | |
| | 20 | 205 | 545 | 2550 | 810 | 57 | 45 | 270 | | Heavy, |
| | 30 | 255 | 680 | 2415 | 735 | 57 | 46 | 235 | | yellow |

and 21 in Table V. However, the sulfur-selenium stock had more, rather than less, bloom. The bloom apparently was principally selenium as it was a much brighter yellow than the ordinary sulfur bloom, which is dusty gray tinged only faintly with yellow. In addition, the selenium imparted a fairly strong reddish-tan color to the stock. Tested later in a red stock, selenium proved to have enough effect to throw the color definitely to a muddy shade.

A combination of 1 part sulfur with 1 part tellurium (Tellov) resulted in a stock whose properties were definitely inferior to those of a sulfur-selenium compound. This did not bloom as heavily, but the physical properties of the compound were unsatisfactory. Work with tellurium was dropped when other means were found to produce a non-blooming stock with excellent properties.

As indicated earlier, the method employed to obtain a well cured non-blooming stock was to use a combination of elemental sulfur and an organic sulfide. The amount of sulfur used is less than that which will bloom from Butyl. The organic sulfide furnishes the additional sulfur needed for cure and also does not bloom. A satisfactory organic sulfide is 4,4′ dithiodimorpholine which is sold under the trade name of Sulfasan R. This has some use in natural rubber and butadiene-styrene copolymers but has not previously been suggested for use in Butyl.

A comparison of results obtained with Compounds 23 and 24 (Table VI) with Compound 18 (Table V) indicates that 1 to 1.25 PHR of Sulfasan R is a satisfactory amount to use with 1 PHR of elemental sulfur. Such compounds have higher modulus, lower elongation, and distinctly lower permanent set than a compound cured with 1 PHR of sulfur alone. Amounts of Sulfasan R less than 1 PHR do not appear to be as satisfactory and amounts greater than 1.25 PHR do not appear to be necessary.

TABLE VI—USE OF SULFUR-MORPHOLINE DISULFIDE COMBINATIONS TO VULCANIZE HI-SIL 202-LOADED GR-I COMPOUNDS

| Formulae | 22 | 23 | 24 | 25 |
|---|---|---|---|---|
| GR-I-15 | 100.0 | 100.0 | 100.0 | 100.0 |
| Hi-Sil 202 | 39.0 | 39.0 | 39.0 | 39.0 |
| Zinc Oxide | 5.0 | 5.0 | 5.0 | 5.0 |
| TMTDS | 2.0 | 2.0 | 2.0 | 2.0 |
| Sulfur | 1.0 | 1.0 | 1.0 | 1.0 |
| Morpholine Disulfide (Sulfasan R) | 0.75 | 1.0 | 1.25 | 1.5 |
| Paraffin | 0.75 | 0.75 | 0.75 | 0.75 |
| Diethylene Glycol | 2.5 | 2.5 | 2.5 | 2.5 |
| BxDC | 1.0 | 1.0 | 1.0 | 1.0 |

| Comp. | Cure at 320° F. (Mins.) | Modulus 300% | Modulus 500% | Tens. | Elong. | Duro. Hard. 0″ | Duro. Hard. 30″ | Crescent Tear (lbs./in.) | Perm. Set. | Bloom |
|---|---|---|---|---|---|---|---|---|---|---|
| 22 | 7.5 | 110 | 300 | 2470 | 930 | 53 | 42 | 300 | | |
| | 10 | 230 | 570 | 2600 | 800 | 56 | 46 | 270 | | |
| | 15 | 260 | 610 | 2520 | 780 | 57 | 48 | 250 | | |
| | 20 | 260 | 700 | 2510 | 740 | 60 | 50 | 240 | 35 | None |
| | 30 | 260 | 720 | 2380 | 700 | 60 | 51 | 230 | | |
| 23 | 7.5 | 170 | 340 | 2570 | 930 | 54 | 43 | 330 | | |
| | 10 | 240 | 550 | 2520 | 790 | 56 | 47 | 270 | | |
| | 15 | 240 | 640 | 2520 | 760 | 57 | 48 | 250 | | |
| | 20 | 260 | 720 | 2430 | 720 | 57 | 49 | 240 | 33 | None |
| | 30 | 260 | 720 | 2340 | 700 | 60 | 50 | 220 | | |
| 24 | 7.5 | 160 | 340 | 2520 | 950 | 53 | 42 | 320 | | |
| | 10 | 200 | 510 | 2670 | 840 | 56 | 46 | 260 | | |
| | 15 | 210 | 610 | 2550 | 780 | 56 | 47 | 250 | | |
| | 20 | 230 | 640 | 2480 | 750 | 59 | 49 | 270 | 33 | None |
| | 30 | 260 | 710 | 2510 | 730 | 60 | 50 | 230 | | |
| 25 | 7.5 | 155 | 340 | 2545 | 995 | 57 | 41 | 325 | | |
| | 10 | 155 | 360 | 2565 | 885 | 57 | 42 | 315 | | |
| | 15 | 185 | 445 | 2530 | 835 | 58 | 44 | 300 | | |
| | 20 | 225 | 550 | 2510 | 785 | 57 | 46 | 245 | 37 | None |
| | 30 | 235 | 625 | 2500 | 765 | 59 | 47 | 245 | | |

TABLE VII—COMPARISON OF VARIOUS LOADINGS OF HI-SIL 202 IN GR-I COMPOUNDS CURED WITH 2 PHR TMTDS

| Formulae | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 |
|---|---|---|---|---|---|---|---|---|---|
| GR-I-15 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Hi-Sil 202 | 39.0 | 58.5 | 40.0 | 39.0 | 58.5 | 40.0 | 39.0 | 58.5 | 40.0 |
| Calcene NC | — | — | 40.0 | — | — | 40.0 | — | — | 40.0 |
| Soft Clay | — | — | 40.0 | — | — | 40.0 | — | — | 40.0 |
| Zinc Oxide | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| TMTDS | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Sulfur | 2.0 | 2.0 | 2.0 | 1.5 | 1.5 | 1.5 | 1.0 | 1.0 | 1.0 |
| Sulfasan R | — | — | — | — | — | — | 1.5 | 1.5 | 1.5 |
| Diethylene Glycol | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Paraffin | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| BxDC | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

| Com. | Cure at 320° F. (Mins.) | Modulus 300% | Modulus 500% | Tens. | Elong. | Duro. Hard. 0″ | Duro. Hard. 30″ | Crescent Tear (lbs./in.) | Bloom |
|---|---|---|---|---|---|---|---|---|---|
| 26 | 7.5 | 230 | 470 | 2370 | 950 | 52 | 41 | 380 | |
| | 10 | 280 | 440 | 2600 | 900 | 54 | 44 | 360 | |
| | 15 | 260 | 530 | 2650 | 860 | 56 | 46 | 260 | |
| | 20 | 300 | 620 | 2570 | 790 | 56 | 46 | 230 | Heavy |
| | 30 | 330 | 770 | 2410 | 720 | 56 | 47 | 200 | |
| 27 | 7.5 | 210 | 370 | 1620 | 920 | 70 | 55 | 330 | |
| | 10 | 210 | 540 | 1910 | 860 | 70 | 57 | 330 | |
| | 15 | 260 | 680 | 2080 | 830 | 72 | 61 | 280 | |
| | 20 | 280 | 750 | 2080 | 800 | 72 | 60 | 360 | Heavy |
| | 30 | 360 | 960 | 2060 | 720 | 71 | 61 | 280 | |
| 28 | 7.5 | 270 | 620 | 1670 | 760 | 65 | 51 | 270 | |
| | 10 | 280 | 660 | 1660 | 755 | 64 | 49 | 255 | |
| | 15 | 320 | 795 | 1695 | 710 | 67 | 54 | 260 | |
| | 20 | 305 | 820 | 1745 | 675 | 71 | 56 | 250 | Heavy |
| | 30 | 385 | 990 | 1680 | 660 | 71 | 58 | 240 | |
| 29 | 7.5 | 170 | 340 | 2370 | 980 | 52 | 40 | 310 | |
| | 10 | 210 | 410 | 2470 | 910 | 52 | 40 | 270 | |
| | 15 | 270 | 510 | 2720 | 880 | 55 | 45 | 250 | |
| | 20 | 270 | 640 | 2780 | 820 | 55 | 45 | 240 | Distinct |
| | 30 | 310 | 720 | 2510 | 760 | 56 | 48 | 200 | |
| 30 | 7.5 | 160 | 330 | 1890 | 1000 | 77 | 59 | 370 | |
| | 10 | 160 | 360 | 1960 | 950 | 76 | 58 | 410 | |
| | 15 | 180 | 440 | 2100 | 900 | 72 | 60 | 370 | |
| | 20 | 240 | 570 | 2170 | 860 | 72 | 61 | 330 | Distinct |
| | 30 | 260 | 670 | 2240 | 810 | 76 | 63 | 330 | |
| 31 | 7.5 | 330 | 650 | 1660 | 780 | 70 | 54 | 280 | |
| | 10 | 340 | 720 | 1600 | 730 | 70 | 54 | 260 | |
| | 15 | 380 | 810 | 1650 | 700 | 72 | 57 | 250 | |
| | 20 | 380 | 840 | 1670 | 700 | 73 | 58 | 270 | Heavy |
| | 30 | 440 | 940 | 1620 | 660 | 75 | 61 | 260 | |
| 32 | 7.5 | 155 | 340 | 2545 | 995 | 57 | 41 | 325 | |
| | 10 | 155 | 360 | 2565 | 885 | 57 | 42 | 315 | |
| | 15 | 185 | 445 | 2530 | 835 | 58 | 44 | 300 | |
| | 20 | 225 | 550 | 2510 | 785 | 57 | 46 | 245 | None |
| | 30 | 235 | 625 | 2500 | 765 | 59 | 47 | 245 | |
| 33 | 7.5 | 180 | 470 | 1990 | 880 | 72 | 55 | 360 | |
| | 10 | 180 | 480 | 2110 | 880 | 72 | 56 | 340 | |
| | 15 | 240 | 610 | 2140 | 820 | 72 | 60 | 300 | |
| | 20 | 270 | 700 | 2140 | 780 | 72 | 61 | 330 | None |
| | 30 | 310 | 820 | 1960 | 740 | 76 | 63 | 290 | |
| 34 | 7.5 | 330 | 720 | 1740 | 750 | 70 | 53 | 290 | |
| | 10 | 330 | 810 | 1720 | 720 | 73 | 57 | 280 | |
| | 15 | 360 | 850 | 1670 | 690 | 73 | 57 | 250 | |
| | 20 | 400 | 920 | 1730 | 670 | 75 | 58 | 260 | None |
| | 30 | 430 | 920 | 1670 | 660 | 75 | 58 | 250 | |

## Loading

Tables VII and VIII give comparisons between GR-I-15 stocks loaded with 20 and 30 volumes of Hi-Sil 202 and with approximately 20 volumes plus additional amounts of non-reinforcing soft clay and calcium carbonate. The comparisons were made using both TMTDS and Tellurac-Zenite accelerations at two different sulfur levels and with a sulfur-Sulfasan R combination.

It will be noted that increasing the loading generally results in increased modulus, considerably higher hardness, and lower tensile strength. Tear resistance is increased somewhat in going from twenty to thirty volumes loading of Hi-Sil 202 and is, of course, decreased when clay and calcium carbonate are both added to the silica.

TABLE VIII—COMPARISON OF VARIOUS LOADINGS OF HI-SIL 202 IN GR-I COMPOUNDS CURED WITH 1 PHR TELLURAC PLUS 1 PHR ZENITE

| | Formulae | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 |
| GR-I-15 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Hi-Sil 202 | 39.0 | 58.5 | 40.0 | 39.0 | 40.0 | 39.0 | 58.5 | 40.0 |
| Calcene NC | —— | —— | 40.0 | —— | 40.0 | —— | —— | 40.0 |
| Soft Clay | —— | —— | 40.0 | —— | 40.0 | —— | —— | 40.0 |
| Zinc Oxide | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Tellurac | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Zenite | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Sulfur | 2.0 | 2.0 | 2.0 | 1.5 | 1.5 | 1.0 | 1.0 | 1.0 |
| Sulfasan R | —— | —— | —— | —— | —— | 1.5 | 1.5 | 1.5 |
| Diethylene Glycol | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Paraffin | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| BxDC | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

| Com. | Cure at 320° F. (Mins.) | Modulus 300% | 500% | Tens. | Elong. | Duro. Hard. 0″ | 30″ | Crescent Tear (lbs./in.) | Bloom |
|---|---|---|---|---|---|---|---|---|---|
| 35 | 7.5 | 170 | 320 | 2190 | 950 | 52 | 41 | 340 | |
| | 10 | 180 | 370 | 2430 | 910 | 54 | 43 | 330 | |
| | 15 | 210 | 450 | 2540 | 890 | 56 | 45 | 300 | |
| | 20 | 230 | 520 | 2480 | 800 | 56 | 46 | 280 | Heavy |
| | 30 | 290 | 630 | 2470 | 770 | 57 | 47 | 240 | |
| 36 | 7.5 | 210 | 450 | 1890 | 900 | 65 | 51 | 320 | |
| | 10 | 260 | 580 | 2130 | 880 | 70 | 55 | 330 | |
| | 15 | 270 | 740 | 2100 | 800 | 70 | 54 | 300 | |
| | 20 | 280 | 740 | 2080 | 800 | 72 | 59 | 330 | Heavy |
| | 30 | 480 | 1150 | 2160 | 740 | 71 | 56 | 290 | |
| 37 | 7.5 | 200 | 480 | 1560 | 870 | 72 | 50 | 260 | |
| | 10 | 200 | 480 | 1600 | 850 | 72 | 52 | 290 | |
| | 15 | 260 | 600 | 1690 | 810 | 73 | 53 | 260 | |
| | 20 | 310 | 680 | 1690 | 750 | 75 | 56 | 260 | Heavy |
| | 30 | 370 | 820 | 1760 | 730 | 75 | 57 | 260 | |
| 38 | 7.5 | 160 | 410 | 2610 | 870 | 57 | 41 | 310 | |
| | 10 | 200 | 450 | 2650 | 860 | 57 | 42 | 340 | |
| | 15 | 230 | 600 | 2640 | 790 | 59 | 45 | 270 | |
| | 20 | 260 | 710 | 2610 | 740 | 59 | 46 | 260 | Distinct |
| | 30 | 300 | 820 | 2480 | 710 | 58 | 46 | 240 | |
| 39 | 7.5 | 180 | 450 | 1490 | 870 | 74 | 51 | 280 | |
| | 10 | 180 | 470 | 1590 | 860 | 73 | 50 | 280 | |
| | 15 | 260 | 580 | 1600 | 800 | 75 | 52 | 280 | |
| | 20 | 300 | 670 | 1670 | 760 | 75 | 54 | 260 | Distinct |
| | 30 | 330 | 770 | 1660 | 720 | 76 | 58 | 250 | |
| 40 | 7.5 | 170 | 470 | 2610 | 840 | 58 | 42 | 290 | |
| | 10 | 230 | 550 | 2640 | 820 | 57 | 44 | 280 | |
| | 15 | 260 | 710 | 2520 | 730 | 58 | 45 | 240 | |
| | 20 | 260 | 790 | 2380 | 690 | 59 | 46 | 240 | None |
| | 30 | 310 | 910 | 2370 | 670 | 58 | 46 | 190 | |
| 41 | 7.5 | 170 | 470 | 2010 | 900 | 67 | 50 | 350 | |
| | 10 | 200 | 530 | 2060 | 840 | 76 | 58 | 330 | |
| | 15 | 270 | 710 | 2080 | 770 | 76 | 60 | 310 | |
| | 20 | 330 | 840 | 2130 | 760 | 77 | 61 | 310 | None |
| | 30 | 380 | 1010 | 2040 | 680 | 76 | 63 | 300 | |
| 42 | 7.5 | 260 | 530 | 1430 | 810 | 72 | 51 | 270 | |
| | 10 | 260 | 550 | 1530 | 790 | 73 | 50 | 280 | |
| | 15 | 310 | 680 | 1730 | 770 | 74 | 54 | 280 | |
| | 20 | 360 | 810 | 1670 | 720 | 75 | 56 | 260 | None |
| | 30 | 400 | 910 | 1700 | 690 | 75 | 57 | 240 | |

## Temperature of Vulcanization

Some of the typical compounds shown in Table VII and VIII were vulcanized at 340°F. The results obtained are shown in Table IX. When these results are compared with the results obtained on the same compounds cured at 320°F. it is seen that the principal effects are a slightly faster rate of cure and slightly higher hardness. Slightly higher moduli are generally obtained but this is not always true. The higher curing does not appear to be particularly advantageous.

## Type of Butyl Rubber

Almost all of the work reported in this paper was done with compounds made with GR-I-15 rubber. It should be clearly understood that the discussion of the various points applies equally well to other types of Butyl such as GR-I-18. Use of the latter polymer results in higher modulus, higher tensile, and lower elongation than are obtained with the same loadings of Hi-Sil 202 in GR-I-15. This can be seen by comparing Compounds 52-54 in Table X with their respective counterparts, Compounds 32-34 in Table VII.

## SUGGESTED RECIPES

The following recipes are suggested as being good starting points for developing white or non-blooming colored Butyl rubber compounds for molded or extruded goods over a range of hardness:

| | A | B | C | D |
|---|---|---|---|---|
| Duro. Hardness, 30″ | 45-50 | 48-53 | 55-60 | 60-65 |
| GR-I | 100.0 | 100.0 | 100.0 | 100.0 |
| Hi-Sil 202 | 40.0 | 40.0 | 40.0 | 60.0 |
| Calcene NC | —— | —— | 40.0 | —— |
| Soft Clay | —— | 40.0 | 40.0 | —— |
| Zinc Oxide | 5.0 | 5.0 | 5.0 | 5.0 |
| TMTDS | 2.0 | 2.0 | 2.0 | 2.0 |
| Sulfur | 1.0 | 1.0 | 1.0 | 1.0 |
| Sulfasan R | 1.0 | 1.0 | 1.0 | 1.0 |
| Diethylene Glycol | 1.5 | 1.5 | 1.5 | 2.5 |
| Paraffin | 0.75 | 0.75 | 0.75 | 0.75 |
| BxDC | 1.0 | 1.0 | 1.0 | 1.0 |

TABLE IX—EFFECT OF 340°F. CURING TEMPERATURE ON SEVERAL TYPICAL HI-SIL 202-LOADED GR-I COMPOUNDS

| | Formulae | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 |
| GR-I-15 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| Hi-Sil 202 | 39.0 | 58.5 | 40.0 | 39.0 | 58.5 | 40.0 | 39.0 | 58.5 | 40.0 |
| Calcene NC | —— | —— | 40.0 | —— | —— | 40.0 | —— | —— | 40.0 |
| Soft Clay | —— | —— | 40.0 | —— | —— | 40.0 | —— | —— | 40.0 |
| Zinc Oxide | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| TMTDS | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | —— | —— | —— |
| Tellurac | —— | —— | —— | —— | —— | —— | 1.0 | 1.0 | 1.0 |
| Zenite | —— | —— | —— | —— | —— | —— | 1.0 | 1.0 | 1.0 |
| Sulfur | 1.5 | 1.5 | 1.5 | 1.0 | 1.0 | 1.0 | 1.5 | 1.5 | 1.5 |
| Sulfasan R | —— | —— | —— | 1.5 | 1.5 | 1.5 | —— | —— | —— |
| Diethylene Glycol | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| Paraffin | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 | 0.75 |
| BxDC | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

| Com. | Cure at 340° F. (Mins.) | Modulus 300% | 500% | Tens. | Elong. | Duro. Hard. 0″ | 30″ | Crescent Tear (lbs./in.) | Bloom |
|---|---|---|---|---|---|---|---|---|---|
| 43 | 5 | 130 | 300 | 2580 | 960 | 60 | 39 | 390 | |
| | 10 | 180 | 410 | 2600 | 890 | 62 | 43 | 270 | |
| | 15 | 200 | 510 | 2600 | 840 | 62 | 43 | 250 | |
| | 20 | 260 | 580 | 2600 | 770 | 65 | 47 | 230 | Distinct |
| | 30 | 210 | 680 | 2510 | 750 | 65 | 48 | 210 | |
| 44 | 5 | 210 | 480 | 1960 | 860 | 72 | 57 | 350 | |
| | 10 | 260 | 580 | 2210 | 870 | 77 | 60 | 340 | |
| | 15 | 300 | 710 | 2180 | 810 | 77 | 61 | 290 | |
| | 20 | 330 | 820 | 2010 | 740 | 77 | 63 | 290 | Distinct |
| | 30 | 360 | 820 | 2070 | 770 | 77 | 65 | 310 | |
| 45 | 5 | 280 | 710 | 1740 | 740 | 70 | 55 | 260 | |
| | 10 | 300 | 710 | 1670 | 710 | 72 | 57 | 260 | |
| | 15 | 330 | 780 | 1600 | 700 | 74 | 59 | 240 | |
| | 20 | 360 | 850 | 1600 | 670 | 75 | 61 | 230 | Distinct |
| | 30 | 380 | 790 | 1550 | 670 | 75 | 60 | 240 | |
| 46 | 5 | 140 | 360 | 2500 | 910 | 60 | 39 | 280 | |
| | 10 | 170 | 530 | 2620 | 860 | 63 | 43 | 290 | |
| | 15 | 210 | 550 | 2620 | 810 | 63 | 43 | 240 | |
| | 20 | 240 | 610 | 2470 | 750 | 65 | 46 | 200 | None |
| | 30 | 270 | 700 | 2340 | 730 | 65 | 47 | 190 | |
| 47 | 5 | 260 | 610 | 2130 | 800 | 76 | 59 | 350 | |
| | 10 | 270 | 750 | 2300 | 770 | 77 | 62 | 330 | |
| | 15 | 340 | 870 | 2180 | 740 | 76 | 64 | 300 | |
| | 20 | 360 | 910 | 2200 | 730 | 77 | 64 | 310 | None |
| | 30 | 330 | 810 | 2100 | 740 | 77 | 65 | 290 | |
| 48 | 5 | 330 | 740 | 1760 | 730 | 72 | 56 | 280 | |
| | 10 | 330 | 820 | 1650 | 690 | 75 | 57 | 250 | |
| | 15 | 330 | 850 | 1630 | 660 | 75 | 58 | 260 | |
| | 20 | 340 | 820 | 1630 | 670 | 76 | 60 | 220 | None |
| | 30 | 330 | 710 | 1520 | 680 | 76 | 59 | 230 | |
| 49 | 5 | 160 | 330 | 2570 | 960 | 60 | 40 | 340 | |
| | 10 | 200 | 450 | 2610 | 880 | 62 | 43 | 290 | |
| | 15 | 210 | 540 | 2710 | 830 | 63 | 45 | 270 | |
| | 20 | 270 | 650 | 2480 | 750 | 64 | 46 | 210 | Distinct |
| | 30 | 330 | 780 | 2600 | 740 | 65 | 47 | 200 | |
| 50 | 5 | 240 | 550 | 2280 | 880 | 76 | 59 | 330 | |
| | 10 | 280 | 710 | 2170 | 800 | 77 | 63 | 310 | |
| | 15 | 340 | 850 | 2210 | 750 | 81 | 66 | 270 | |
| | 20 | 340 | 950 | 2070 | 720 | 81 | 66 | 260 | Distinct |
| | 30 | 370 | 950 | 2110 | 720 | 77 | 65 | 270 | |
| 51 | 5 | 300 | 710 | 1700 | 740 | 72 | 57 | 270 | |
| | 10 | 330 | 780 | 1700 | 710 | 74 | 58 | 280 | |
| | 15 | 380 | 820 | 1660 | 690 | 75 | 61 | 260 | |
| | 20 | 400 | 910 | 1670 | 670 | 76 | 61 | 250 | Distinct |
| | 30 | 400 | 880 | 1460 | 650 | 77 | 62 | 200 | |

Colors and titanium dioxide are, of course, added as required. Colors masterbatched in highly unsaturated elastomers will not interfere with the cure of pastel colored stocks in which only 0.1 to 0.5 parts of the masterbatched color is used. If a deep mass tone, requiring 2 or 3 parts of color, is desired the effect of using masterbatched colors should be carefully observed as 2 or 3 parts of unsaturated rubber may tend to retard the cure of Butyl. It is probably safer to use dry, powder colors in such cases.

The acceleration shown does not cause any discoloration. A Tellurac-Zenite combination will give equally satisfactory cures at slightly lower cost but gives a bluish-gray color which has to be considered if goods are being made in white or certain pastel colors.

Molded goods can be made satisfactorily from any of the compounds shown. Compound A, being the least heavily loaded, has the lowest hardness, in the 42-47 range. Hardness is increased by addition of soft clay to the Hi-Sil 202 and is further increased by the addition of Calcene NC to the Hi-Sil 202-clay loading. Still higher hardness can be obtained by increase in the Hi-Sil 202.

Extruded goods cannot be made satisfactorily from Compound A because it does not have sufficient loading to give a dead running stock. Compounds B, C, and D, however, can all be extraded satisfactorily. Addition of 5 PHR petrolatum to B, C, or D will increase the speed of extrusion slightly.

TABLE X—VARIOUS LOADINGS OF HI-SIL 202 IN GR-I-18

| Formulae | 52 | 53 | 54 |
|---|---|---|---|
| GR-I-18 | 100.0 | 100.0 | 100.0 |
| Hi-Sil 202 | 39.0 | 58.5 | 40.0 |
| Calcene NC | — | — | 40.0 |
| Soft Clay | — | — | 40.0 |
| Zinc Oxide | 5.0 | 5.0 | 5.0 |
| TMTDS | 2.0 | 2.0 | 2.0 |
| Sultur | 1.0 | 1.0 | 1.0 |
| Sulfasan R | 1.5 | 1.5 | 1.5 |
| Diethylene Glycol | 2.5 | 2.5 | 2.5 |
| Paraffin | 0.75 | 0.75 | 0.75 |
| BxDC | 1.0 | 1.0 | 1.0 |

| Comp. | Cure at 320° F. (Mins.) | Modulus 300% | Modulus 500% | Tens. | Elong. | Duro. Hard. 0" | Duro. Hard. 30" | Crescent Tear (lbs./in.) |
|---|---|---|---|---|---|---|---|---|
| 52 | 7.5 | 200 | 540 | 2810 | 800 | 52 | 43 | 260 |
| | 10 | 180 | 540 | 2600 | 800 | 58 | 47 | 220 |
| | 15 | 260 | 740 | 2840 | 750 | 56 | 47 | 210 |
| | 20 | 260 | 790 | 2720 | 720 | 57 | 47 | 190 |
| | 30 | 310 | 940 | 2350 | 660 | 57 | 48 | 180 |
| 53 | 7.5 | 270 | 720 | 2310 | 780 | 71 | 59 | 300 |
| | 10 | 360 | 890 | 2470 | 780 | 73 | 62 | 330 |
| | 15 | 330 | 920 | 2340 | 760 | 73 | 62 | 320 |
| | 20 | 380 | 1010 | 2170 | 700 | 73 | 62 | 270 |
| | 30 | 370 | 1120 | 1940 | 620 | 75 | 64 | 300 |
| 54 | 7.5 | 310 | 720 | 1760 | 730 | 68 | 52 | 290 |
| | 10 | 340 | 850 | 1900 | 720 | 69 | 56 | 250 |
| | 15 | 340 | 880 | 1520 | 630 | 69 | 57 | 250 |
| | 20 | 370 | 950 | 1830 | 670 | 69 | 58 | 230 |
| | 30 | 400 | 1010 | 1720 | 650 | 72 | 61 | 240 |

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(1) Smith, W. C., "Compounding Butyl Rubber for Mineral-Filled Stocks," *I. R. W.*, Vol. 129, pp. 55-60 (Oct., 1953).

(2) Wolf, Ralph F., and Gage, F. W., "Compounding of Butyl Rubber with Fine Particle Silica," *I. R. W.*, Vol. 123, pp. 565-69 (Feb., 1951).

(3) Pigment Data Bulletin No. 53-2, Columbia-Southern Chemical Corp., March, 1953.

(4) Product of the Columbia-Southern Chemical Corp.


# Foam King Process of Producing Foam Plastics

THE completion of research and development on two distinctly new processes for the formulation and manufacture of foam plastics has been announced by Foam King, Inc., 110 West 34th St., New York 1, N. Y. One process concerns itself with the production of an open air cell foam plastic, while the other has to do with the production of closed cell foam plastic.

Foam King "Open Air Cell" is described as resulting from a formulation which obviates pressure tanks and pressure molds. The normal procedure presently employed is to add an inert gas by whipping it into the plastisol under pressure. The mix is then poured from the pressure tank into a mold in its cellular stage and fused. The Foam King method, however, utilizes a prepared plastisol, which when poured into a mold (open or closed) will rise to a predetermined and controlled height and density by the application of low-temperature heat. It is then fused at a higher temperature. The company states that the result is a product enjoying great tensile strength and resilience, excellent recovery and complete uniformity in cell structure. The texture can be varied from a super-fine cell structure to extra-large cells.

The closed cell process, resulting in a product called "Closells", also employs a strictly chemical approach, without the use of pressure molds or high temperatures. Unicellular sponge, the company maintains, is made atmospherically in open molds. "Closells" consist of millions of nitrogen-filled sealed cells, each independent and yet fused together in a molded form or sheeting. It is said to offer superior protection against the penetration of air, dust and water. Both the open and closed cell products are said to possess common qualities, such as flexibility and resistance to rot and mildew, oils, greases, alkalies, acids and most chemicals. Both are unharmed by the elements, the company claims, and will not dry out or crack. In addition, both products will meet the requirements of fire codes for non-flammability.

Foam King further states that skilled technicians are unnecessary in the manufacture of products from both these formulations. Most of the company's research in this field has been devoted to simplifying methods of manufacture to avoid errors and unnecessary expenditures. The company states that these products will answer many problems of industry in packaging, cushioning, insulation, construction, flotation, etc.

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Fatigue properties of sheet stock as thin as 0.010-inch can now be determined on the **Sonntag SF-2-U Fatigue Testing Machine,** according to the Baldwin-Lima-Hamilton Corp., Philadelphia 42, Penna. A new accessory fixture developed by the Sonntag Scientific Corp. is furnished with the machine. Former minimum thickness of specimens was two and a half times this figure.

# New Compound for Re-Usable Rigid Spray Masks

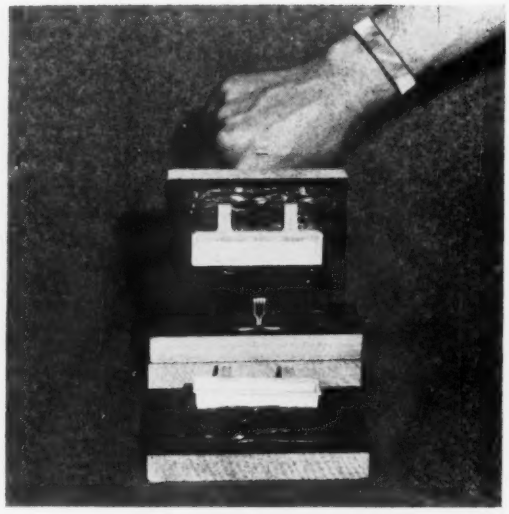
A PLASTIC putty for making re-usable spray masks, stencils and cementing fixtures for toys, signs, fire alarm boxes, and general industrial equipment has been developed by the Chemical Development Corp. of Danvers, Mass. It is used to protect or mask off metal, plastic and other surfaces during paint spraying, cementing, flocking or similar operations. It is also being used for making jigs and fixtures for holding parts during cementing and machining, for low-pressure forming dies, for making molds for a large number of models, and for countless other uses.

Called "CD Spray Mask A", the material is supplied as a putty that will harden to an extremely strong, tough and rigid solid within one to two hours after the addition of a catalyst or hardening agent. No heat or pressure is required, the company states, advising that it is now possible for any company to make their own spray masks, cementing fixtures, and other parts in a matter of a few hours, rather than days, and at a fraction of previous costs.

CD Spray Mask A makes a precision reproduction of surfaces without distortion or shrinkage. It is easily applied to the desired surface or model with a putty knife and will stick to a vertical surface without sagging. A thick or thin coat can therefore be produced at one time. The company states that it is not necessary to cast a thick block of material around the model and then machine it down to the desired size. The proper thickness for reinforcing or for other purposes can be applied at the start and the final product will correspond exactly to that size and shape. Parts can be built up later by simply adding additional material. When hardened, it is simply lifted off the model and then carved or machined with a portable, dentist-type drill, or sawed, drilled, threaded, and sanded with regular metal working equipment.

When hardened, the product is unaffected by acetone, most solvents, oils and water. It has a high impact, tensile and compressive strength. It is light in weight and has good adhesion to itself and many other surfaces.

*Shown above is a spray mask for a doll head which has been made of CD Spray Mask A. The total working time to produce the spray mask is said to have been one hour.*



*The fixture above, also made of CD Spray Mask A, was designed to hold parts during cementing operations. The fixture is holding cavities made of the same material.*

The product is also said to have excellent shelf-life before the hardening agent is added and can be stored at 70°F. for more than one year. At the present time it is supplied in 1, 3, 12 and 60-pound containers, as well as in 55-gallon drums. The proper amount of catalyst or hardening agent is supplied with every purchase. A special release agent or material to prevent CD Spray Mask A from adhering to the model is also supplied.

It is interesting to note that the material will start to harden approximately one hour after the catalyst has been added and that the product will have about 40% of its final strength in four hours at room temperature. At that time it can be carefully handled. Practically full strength is reached in 24 hours and the ultimate strength is obtained in approximately four days at room temperature. These times can be greatly accelerated if an infrared lamp or other heat is used. Localized heating should be avoided, however, as this may distort the product.

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Designed to simulate the temperature range of high altitude sonic flight, a new **industrial test chamber** which can drop temperatures from +600° to −100°F. in less than two hours is now being produced by Conrad, Inc., of Holland, Mich. Applicable for chemical and other uses, the new test chamber is said to take the place of the two units (heating and cooling) previously needed for this type of testing.

Fatigue tests under loads up to 50,000 pounds on a 10,000-pound capacity fatigue machine are provided by a new **Sonntag Five-to-One multiplying fixture** developed by the Baldwin-Lima-Hamilton Corp., Philadelphia 42, Penna. The new accessory fixture is especially suited for testing flat materials, including plastics and metals, as well as for joints that are riveted, welded or bonded.

# C. I. C. Division of Rubber Chemistry Meets in Toronto on June 23

THE Annual Conference of the Rubber Chemistry Division of the Chemical Institute of Canada will be held on Wednesday, June 23, at the Royal York Hotel in Toronto. It will be a one-day meeting and is being held in conjunction with the General Conference of the parent society.

The divisional meeting will feature the presentation of eight technical papers, all varied in nature, as well as a business session and the usual divisional banquet. The business session will be held toward the close of the morning's program while the banquet will be held at the Royal York the same evening. Dr. B. B. Hillary, executive assistant of the Dow Chemical Co., will be guest speaker at the banquet.

G. D. Stevens, of the Goodyear Tire & Rubber Co. of Canada, chairman of the Rubber Chemistry Division, will preside at the morning session, and Harold Loiselle will act as chairman for the afternoon session. Abstracts of the eight technical papers, together with their authors and company connections, follow herewith:

## ABSTRACTS OF PAPERS

**Promoters for the Reaction of Carbon Black With Rubber.** ***Kenneth W. Doak, George H. Ganzhorn, and Bernard C. Barton (General Laboratories, U. S. Rubber Co., Passaic, N. J.). (Paper will be presented by Mr. Doak).***

Heating unvulcanized mixtures of rubber and carbon black change the physical properties of the resulting vulcanizates, giving increased electrical resistivity, reduced hysteresis and hardness, higher modulus at high elongations, and increased abrasion resistance. This is believed to be the result of improved dispersion of carbon black, caused by a chemical reaction between rubber and carbon black.

In this paper, the factors affecting the rate of the reaction will be discussed. The rate depends on the time, temperature, degree of unsaturation of the rubber and the type of black. A variety of chemical promoters increase the rate of the reaction. Several classes are organic peroxides, N-halogenated imides, aromatic nitroso compounds, certain quinones, and active halogen compounds such as hexachlorocyclopentadiene and hexachlorophenol.

The effectiveness of these promoters depends on the kind of rubber and carbon black used. For example, peroxides are especially effective in Hevea rubber and GR-S containing channel black, and when properly used give the expected improvements in physical properties without adversely affecting tensile strength. N-Halogenated imides are particularly effective in Butyl rubber containing channel or furnace black. It is suggested that these promoters initiate allylic radicals on rubber chains, which can react with carbon black to form primary valence bonds.

**Low Temperature Plasticizers.** ***M. A. Pollack (W. C. Hardesty Co., New Toronto, Ont., Canada).***

In order to produce elastomers which will not stiffen and crack in the cold, it is necessary to select plasticizers very carefully. Plasticizers differ widely in their effectiveness at low temperatures, and the reasons for this are looked for in the fundamental properties of the plasticizers. Contrary to what might be expected, the freezing point of the plasticizer is found to have no significant bearing on the cold resistance of a polyvinyl chloride compound. On the other hand, the viscosity and viscosity index are shown to be directly correlated with low temperature performance. The most desirable combination is a low viscosity and a high viscosity index. This same combination has long been in great demand in the lubricant industry, and we now find some of the best low-temperature plasticizers going into the production of lubricants, particularly for aircraft.

**Kinetics and Cross-Linking Efficiency in Mercaptobenzothiazole Vulcanization.** ***Irving Auerbach (Goodyear Tire & Rubber Co., Akron, Ohio).***

In a previous publication [*Ind. Eng. Chem.*, Vol. 45, p. 1526 (1953)] a kinetic expression was presented for the vulcanization of GR-S. This expression suggested a secondary reaction between combined and uncombined sulfur. This has been substantiated experimentally. Rubber samples which were cured with a mercaptobenzothiazole formulation were extracted to remove unreacted accelerator and sulfur. These were allowed to react with additional sulfur. The rate of sulfur uptake was greater than that of the controls and the kinetic data obtained agreed substantially with that given in the rate equation.

Cross-linking efficiency, i.e., the number of sulfur atoms per cross-link, varies with accelerators and formulation conditions. A study has been initiated to determine the factors which influence this efficiency with mercaptobenzothiazole formulations. Cross-links are most reliably determined by swelling volume techniques. Because this method is time consuming, a procedure has been worked out whereby cross-linking efficiency is obtained from modulus data. These values are in agreement with those obtained by swelling volume measurements.

The kinetic expression previously referred to suggests that increasing the mercaptobenzothiazole concentration should improve the cross-linking efficiency. This was substantiated when an increase of accelerator from 1 to 5 parts changed the efficiency from 7 to 3 sulfur atoms per cross-link. The effects of zinc oxide, zinc mercaptide of mercaptobenzothiazole and zinc laurate on cross-linking efficiency were also determined.

Whereas the cross-linking efficiency is constant throughout the curing process for GR-S, it varies in natural rubber. It is best during the initial stages. The efficiency was apparently dependent on the amount of mill breakdown of the rubber.

**Carboxylic Nitrile Rubber—A New High Strength Elastomer.** ***H. P. Brown and N. G. Duke (B. F. Goodrich Chemical Co., Cleveland, Ohio). (Paper will be presented by Mr. Duke).***

Carboxylic-bearing monomers have been combined with butadiene and acrylonitrile to give nitrile rubbers of exceptional stress-strain properties. This improvement is particularly apparent in the vulcanizates of pure gum stocks and latex films. This paper discusses properties of both dry rubber and latex forms of such polymers and makes direct comparisons with their normal nitrile rubber counterparts.

The carboxylic polymers show more versatility than normal rubbers with respect to methods of vulcanization. Excellent cures can be obtained by the use of bivalent metal oxides or salts alone. Certain properties, namely compression set, are improved by using a combination metal oxide-sulfur type system. The mechanism of bivalent metal vulcanization is discussed briefly.

The oil resistance of the carboxylic nitrile rubbers is, in general, better than the corresponding normal nitrile rubber. Other properties discussed include compatibility with other rubbers and resins, processing characteristics, compression set, water resistance and adhesive properties. The unusual penetrating

power of the latex and resistance of latex films to dry cleaning fluids such as trichloroethylene are also presented.

The physical and chemical characteristics of the latex are reviewed. Attention is given to techniques for adjusting the pH of the latex and improving mechanical stability. Latex films can be formed by conventional casting or coagulant dip methods. This paper suggests a number of commercial applications for the carboxylic nitrile rubbers where their high strength and good aging properties can be used to advantage. In the textile, paper and leather industries, the strength, adhesive properties and high penetrating power of the latex form holds much interest for further consideration.

Two carboxylic nitrile latices are commercially available from the B. F. Goodrich Chemical Company and are identified as Hycar 1571 and Hycar 1572. The dry rubbers are not available at present and are not anticipated on a commercial scale in the near future.

**Ozone Resistance of Butyl Vulcanizates.** ***D. C. Edwards and E. B. Storey (Polymer Corp., Sarnia, Ont., Canada). (Paper will be presented by Mr. Storey).***

A study of the cracking behavior of Butyl rubber vulcanizates exposed under static strain in an atmosphere containing 25 parts per hundred million of ozone, including the development of a means of rating the severity of cracking in triangular strip specimens. The compounding factors studied include raw polymer unsaturation, mixing and processing variables, state of cure, plasticizer and black loadings, antioxidants and waxes. Cracking increases moderately with increasing raw polymer unsaturation, and is markedly reduced with increasing state of cure. Black loadings in excess of 40 parts per 100 RHC are desirable. Plasticizers are generally detrimental to ozone resistance; the effect is proportional to plasticizer loading, but varies considerably between plasticizers. The antioxidants tested were all of some benefit, but none offered complete protection at conventional loadings. Variations in laboratory mixing, extruding and curing techniques caused no substantial change in cracking behavior. Through careful choice of plasticizer, and a suitable state of cure, it is possible to prepare low cost, highly-resistant compounds without reliance on waxes or excessive antioxidant loadings.

**Carbon Blacks for the Rubber Industry.** ***Leslie D. Carver (Continental Carbon Co., New York, N. Y.).***

Of all the materials available to the rubber chemist carbon black undoubtedly stands out as the most important and essential engineering ingredient; its application is synonymous with the governing material, rubber.

Carbon black may be considered as one of the significant factors contributing to the concept of pigment reinforcement with regards to rubber. Prior to 1920 much reliance was still placed on sulfur in the vulcanization reaction so that a considerable part of the reinforcement benefit was dissipated through degradation of the rubber. From 1913, when carbon black was first used as a reinforcing pigment, production has kept pace with the increasing use of rubber both in quantity and quality as demonstrated by the newer and more efficient blacks developed through research.

The principal types of carbon blacks are channel, furnace and thermal. Channel blacks are prepared from natural gas by the controlled incomplete combustion of small flames impinging on a metal channel. Furnace blacks are produced by the controlled incomplete combustion of natural gas and/or oil introduced into furnaces where the reaction takes place. The third principal type, thermal black, is manufactured by the alternate heating and cracking of natural gas and air in a furnace. A fourth type black, acetylene, is obtained by a special process consisting chiefly of the cracking of acetylene gas by exothermic decomposition.

The evolution of carbon black has produced blacks with widely varying properties so today we have tailor-made varieties and sub-varieties which offer unlimited applications and possibilities. In the course of theoretical as well as practical experimentation, it has been proved that carbon black is the ideal reinforcing agent since it is chemically inert, yet physically active; easily "wet" by rubber, yet forming bonds between carbon and rubber equal in adhesive power to those existing in the rubber mix itself.

**Influence of Various Weathering Factors on Ozone Cracking of Natural and Synthetic Rubbers.** ***W. G. Mayes (Chemical and Physical Research Laboratories, Firestone Tire & Rubber Co., Akron, Ohio).***

A study has been made of the relationship between the depth of ozone cracking and such variables as: (1) ozone exposure temperature, (2) type of rubber compound, (3) type and extent of elongation, (4) wax content of the stock, (5) ozone concentration, (6) time of ozone exposure, (7) the amount of light during ozone exposure, and (8) state of cure.

In a comparison of the ozone resistivities of compounds based on several commercial polymers, the following order of decreasing resistivity was found: (1) Butyl rubber, (2) neoprene, (3) Butaprene NSP-98, (4) Hevea, and (5) GR-S. This order of resistivity was found to hold over the temperature range of −20°C. to +60°C.

In a study of the influence of ozone exposure temperature on the depth of ozone cracks (at an ozone concentration of 25 pphm) it was found that, in the range from −20°C. to +60°C., the most severe ozone cracking took place at 40°C.

The presence of 2 percent wax in Hevea or GR-S was found to afford no protection against ozone cracking at temperatures of 40°C. or higher, presumably because the wax becomes soluble in the compound at these temperatures. Light was found to decrease the extent of ozone cracking on a compound under either static or dynamic elongation. Depth of ozone cracking is a minimum at optimum cure. Ozone cracking and the molecular weight between cross-links were found to be linearly related—the lower the molecular weight between cross-links, the shallower the ozone cracks.

The subject of the paper might be of interest to the general public in that through knowledge of the influence of the various weathering factors on ozone cracking of rubber, it will be possible to better protect rubber goods from the atmosphere. The consumer will benefit by receiving a product (as for example a tire) which will have a longer life, by virtue of being relatively free of weather cracks. (NOTE: The research reported upon in this paper was supported by the Ordnance Department, U. S. Army).

**Statistics—A Tool in Testing Rubber.** ***Robert D. Stiehler (National Bureau of Standards, Washington, D. C.).***

The value of statistics in the investigation and testing of materials is becoming more and more evident. Statistical techniques provide the tools required by the technologist for the efficient and effective planning or design of experiments, assessing the validity of the data, interpreting the experimental results, and comparing the relative merit of methods of test. Some of the applications of these techniques at the National Bureau of Standards to the testing of rubber are discussed, including the measurement of tensile strength, stress and strain of GR-S vulcanizates, viscosity of polyisobutylene solutions, and treadwear of tires. A brief discussion of the behavior of measurements, precision, sensitivity of test, random errors, and systematic biases is also given. Tire testing is used to illustrate the economic aspect of testing. In this connection, the tire tester under development at the National Bureau of Standards is briefly described.

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Precision Scientific Co., Chicago 47, Ill., announces new models of their **laboratory constant temperature baths** with higher temperature range and an adjustable shelf for greater versatility. The baths have stainless steel interiors and exteriors and have been increased in wattage by 66% or more. They now combine the functions of serological and utility-purpose baths.

The availability of an **acid wagon** has been announced by the Automotive Rubber Co., of Detroit, Mich. Made in various sizes, one model can hold more than 400 gallons. These wagons come equipped with tow bar, axles, wheels, tires, four 50-foot lengths of acid hose, overflow funnel, gauge glass and fittings, and other accessories.

# *Editorials . . .*

## First Step

THE first hurdle of the plan to turn the government-operated synthetic rubber facilities over to private industry has been passed. Under the terms of the Rubber Disposal Law the deadline of May 27, 1954, was established for the receipt of bids on any or all of the facilities involved, including 13 copolymer plants, 8 petroleum-butadiene plants, 2 Butyl rubber plants, and 1 styrene plant, the latter producing one-third of the requirements of the copolymer units. The date is passed, the bids are in, and the first step in the disposal pattern has been taken.

As reported in complete detail elsewhere in this issue, a total of 36 companies entered bids (including 2 late comers) for a total of 57 bids, with many firms offering to buy two or more facilities. In addition, 19 alternate bids were received from the same concerns, these latter bids actually being "second choices," effective only if the company loses out on its first choice. Accordingly, a grand total of 76 bids was received, which exceeded the expectations of the Rubber Producing Facilities Disposal Commission, the agency charged with the preparation of a disposal package.

The Disposal Commission was most careful not to reveal any essential information concerning the nature and character of the bids received, but it is believed that most of the bids received covered the petroleum-butadiene plants, these bids being proportionately higher than those for the copolymer units. As expected, all of the major rubber companies submitted bids for the latter units, and again although no hint of the bids received was given, one Commission spokesman stated that preliminary examination "indicates the bids will form a sound basis for forthcoming negotiations." No disclosure was made whether any bids had been received for either of the two alcohol-butadiene plants, which are problem children as far as the industry and the Disposal Commission are concerned.

The three-man Disposal Commission now enters into a very difficult seven-month period, during which negotiations must be carried out with the private bidders. Although some of the negotiations may be cut and dried, a good deal of horse-trading is permitted under the specific terms of the Disposal Law. For example, if the high bidder on any facility—copolymer, Butyl, butadiene or styrene—is turned down for any reason whatsoever, the Commission has the right to turn to the next highest bidder. Needless to state, the Commission would do its utmost in such cases to try to up the ante of the second highest bidder to the offer originally made by the top bidder. Some concessions might have to be made in such instances by both sides.

There is another quirk in the law, namely, if a company is outbid for some particular facility it may get a chance to enter a bid for another which otherwise might not be sold. Since no concern originally entering a bid for a copolymer unit, for example, would like to be left completely out in the cold, this flexible bidding procedure could readily assure the disposal of all thirteen of the copolymer units involved in the disposal program, despite the fact that it is believed the bids did not cover all of these specific units. Then, too, the Commission has some leeway with regard to the technical competence of any bidder, irrespective of the amount of the bids entered.

All in all the Disposal Commission faces an interesting seven-month period. It must conclude satisfactory price arrangements with individual bidders by December 27 and must submit a complete package to Congress by January 29. This package must assure the production of at least 500,000 long tons of general-purpose (GR-S) and 43,000 long tons of special-purpose (GR-I) synthetic rubber per year. Congress then has a 60-day period in which to permit the negotiated contracts to go into effect or to cancel any or all of them. If in this cancellation the stipulated annual production falls short, the entire disposal program may be completely stymied.

Although the first step in the disposal program has been taken, the end-result is far from view. It must be borne in mind that the Commission can negotiate but the final say rests with Congress. Herein lies the danger of the entire program. As we have stated in these columns on several occasions, the synthetic rubber situation lends itself to treatment as a political football. If such tactics are adopted, and they may well be, the goal line will not be easily crossed. Fortunately, the members of the Disposal Commission are all good referees, and they can be counted upon to see that fair play will be the order of the day.

# Highlights and Sidelights of the news...

June, 1954

The Disposal Commission has released its long-awaited listing of companies who have made a bid for one or more of the government's synthetic rubber facilities (page 401) . . . Of particular interest are the several new companies which have been formed expressly to bid on the plants (page 402) . . . The recent suit brought by a School Board in Texas and which involved valuation of RFC plants in that state has finally been adjudged in favor of RFC (page 403).

The Eleventh Meeting of the International Rubber Study Group, recently concluded in Ceylon, seemed to dispel any idea of a buffer stock for natural rubber within the foreseeable future (page 404). . . . Other facets of the natural rubber situation are reported upon by W. J. Sears, vice-president of R.M.A. and chief U. S. delegate to the recent quality conference in Singapore . . . Next quality meeting—New York in October (page 418).

American Viscose has come up with a new type of synthetic rubber named Filastic. . . . The process for making the material was contained in a "sleeper" paragraph of a patent originally issued in 1946. . . . The company expresses the opinion that it may have a commercial product of merit in the discovery (page 411).

Production of rubber processing chemicals in 1953 was some 14% above figures for 1952, according to a recently released report by the U. S. Tariff Commission. . . . Sales were up about $6,000,000, reflecting increases in the consumption of rubber in 1953 (page 409).

The National Credit office sees capital expansion in the rubber industry in 1954 paralleling 1953. . . . Recent excursions by the rubber industry into plastics and other and non-related lines should have a stabilizing effect (page 415).

U. S. Rubber began production of Koylon foam on May 26 at its new plant at Santa Ana, Calif. (page 426) . . . while a suit brought against the company and Dunlop Rubber by the government involving the anti-trust laws has been settled with the filing of a consent decree (page 410).

# NEWS REPORTS and Industry Activities

## DISPOSAL COMMISSION REPORTS TO CONGRESS ON COMPANIES BIDDING FOR SYNTHETIC PLANTS

THE long-awaited report on proposals to purchase the government-owned synthetic rubber facilities and related equipment was transmitted to the Senate Committee on Banking and Currency and to the House Committee on Armed Services on June 1 by the Rubber Producing Facilities Disposal Commission. Some 54 distinct bids were made in the original report, and these were joined on June 2 by two more bids which had been made before midnight on May 27.

The Disposal Commission made it clear that it was keeping the actual bids made by the 56 interested parties confidential until it had an opportunity to examine the offers. The report listed only the names of the bidders. The final list of prices offered will not go to Congress until the Disposal Commission has completed negotiations with the individual bidders. The report follows in full:

The Rubber Producing Facilities Disposal Commission, appointed by the President, pursuant to Public Law 205—83rd Congress—Chapter 338—1st Session, submitted a Progress Report to the Congress on March 15, 1954. We now present a supplemental report since the period fixed for receipt of proposals to purchase 27 government-owned synthetic rubber facilities and related equipment ended May 27, 1954.

We are pleased to attach a list of industrial firms which have submitted proposals. Eligibility of the proposals will be determined by the Commission as soon as possible. Each proposer will be sent official notice of qualification.

The purchase price is shown in only one copy of each proposal. This copy was forwarded in a separate sealed envelope addressed to the Chairman of the Commission. These precautions were taken to guard against any premature disclosure of the amount of a bid prior to the time when the Commission considers such disclosure desirable in furtherance of negotiations and developments of a complete program for presentation to the Congress. The Commission has no control, and has not attempted to exercise control, over disclosures by bidders.

### *Interprets Assignment*

We interpret our assignment as a responsibility to aid in the carrying out of an important national program as determined by the Congress for the transfer of a going profitable, essential business from government to private ownership and operation, under competitive, free enterprise conditions.

In the forthcoming negotiation period, prices, competitive aspects with particular regard to small business enterprises, national security, technical competence and financial responsibility will be considered by the Commission in discussions with industrial management. The law requires that the Attorney General shall also be consulted and pass upon the recommended sale of all facilities. We acknowledge gratefully the assistance already received from his staff.

In conducting negotiations, the Commission, as required by Section 16 of the Disposal Act, will use "as the basis for negotiating . . . the highest amount proposed to be paid for each facility" and will negotiate first with the bidder offering the highest amount for each facility.

The Disposal Act imposes a number of conditions which must be met in order that the program presented to the Congress may be acceptable. It is the opinion of the Commission that the last several months of 1954 will be required to meet all these conditions, including the preparation and execution of contracts of sale, submission of the program to the Attorney General, and preparation of the Commission's report to the Congress.

While the Commission intends to afford prospective purchasers ample time for negotiation, the Commission announced in April that it may at any time after May 27th, exercise its right to accept that proposal which represents, in the Commission's judgment, the highest monetary return to the government with respect to each facility consistent with all requirements of the Act, and thereafter to proceed with the preparation of contracts of sale.

Within 30 days after December 27, 1954, the Commission will submit its recommendations to the Congress.

During negotiations, the Commission may negotiate with respect to any facility with any bidder who has submitted a proposal on that facility or any similar facility, as provided in Section 16 of the Disposal Act. The Commission feels that this provision in the law may broaden the sales pattern and increase the effectiveness of the program.

The law provides that no program can be effected unless, in the aggregate, facilities sold are capable of producing annually at least 500,000 long tons of general-purpose synthetic rubber and at least 43,000 long tons of Butyl rubber. The total rated annual capacity of the 13 general-purpose rubber plants is 860,000 long tons. The two Butyl rubber plants have a rated annual capacity of 90,000 long tons.

Also under the Disposal Law, the two alcohol butadiene facilities (both now in standby) may be either leased or sold. Other facilities must be sold or put in standby condition.

### *Completes Plant Visits*

In the past few months, the Commission has visited every government-owned plant involved in the disposal program. We have met and exchanged views with officials and employees of every company which operates a plant. The location of the plants and the present operators are detailed in an attachment to this report. We have also inspected the government-owned research laboratory at Akron, Ohio, and have consulted with the officials directing that operation.

In addition, staff members of the Commission visited the Canadian government-owned plants in Sarnia, Ontario, in order to become familiar with facilities in that country. We have had numerous consultations with many industrial executives over the past few months, assisting them in every way possible.

The Commission now enters a period of difficult negotiation. We are hopeful that a satisfactory program can be formulated for consideration of the Congress.—End of Report.

(EDITOR'S NOTE: The listing of firms making bids for the synthetic facilities, as noted in the report, appears in an accom-

panying table. Another table listing the plants being offered for sale also is published herewith).

Among the companies listed as a bidder for one or more of the synthetic rubber facilities is found a new entity, Petroleum Chemicals Inc. This company has been jointly formed by the Cities Service Co. and the Continental Oil Co., and it is understood that it is primarily interested in Butyl production, whether or not it secures one of the two government-owned Butyl plants. It is further understood that Petroleum Chemicals has an arrangement with the Thiokol Chemical Corp., whereby Thiokol will handle research, development and sales for any synthetic rubbers produced by the company.

It has also been made known that Merck & Co., Inc., and the Climax Molybdenum Co. have submitted a joint bid for one of the government-owned butadiene plants.

### *American Synthetic Formed*

One of the firms entering a bid for one of the government's synthetic rubber facilities, as noted in the accompanying table, is the American Synthetic Rubber Corp. This company was recently organized, specifically to bid for one of the plants. The new company, incorporated in Delaware, is jointly owned by 29 firms engaged in the manufacture of rubber products and chemicals, with the individual companies subscribing amounts ranging from $5,000 to $2,000,000.

Thomas Robins, Jr., president of Hewitt-Robins Inc., Stamford, Conn., and also president of the Kentucky Synthetic Rubber Corp., Louisville, Ky., took the lead in organizing the venture. Fifteen of the 19 firms comprising the Kentucky Synthetic Rubber Corp. for the past four years are shareholders in the new coalition.

Mr. Robins has been active in the government synthetic rubber program since 1941 when he helped to organize the National Synthetic Rubber Corp., a five-company group which operated the government-owned synthetic plant at Louisville. This plant was closed at the end of World War II and then reopened in 1950, under the management of the Kentucky Synthetic Rubber Corp., headed by Mr. Robins. The plant was "de-mothballed" and put into operation in record time when synthetic facilities were reactivated by the government to meet the rubber shortage resulting from the Korean war. Since that time, the plant has met all production goals and it has had the best safety record among the synthetic plants.

Mr. Robins said the new corporation "is unique in the rubber industry and possibly is the only one of its kind in America." He pointed out that there are several "joint venture companies" in existence with as many as 5 members but few if any with as many as 29. In organizing the American Synthetic Rubber Corp. no applicant for membership has been turned down. All shareholders in the new company are rubber consumers except the American Cyanamid Co., which is the largest single shareholder with a subscription amounting to approximately one-third of the total capital.

Each consumer-stockholder will receive a basic allotment of approximately 500 tons of rubber per year for each $50,000 of investment. However, the allotments can be refused without penalty if the rubber is not desired. American Cyanamid, which is a major producer of rubber chemicals and a leader in rubber research and development, but not a consumer of rubber, will market a portion of the output to customers outside the coalition through its technical service sales organization.

The organizational structure of the new corporation will follow what has been termed "practical and democratic" lines. The board of directors, consisting of 10 members, will be chosen from four major groups into which the 29 participating companies have been lumped in the interest of streamlined administration. Three groups which have subscribed the larger amounts of capital will be entitled to three directors each. The fourth group, with a proportionately smaller investment, will elect one director. Thus all participants will have a voice in the management and no one company will be able to exercise control. Thomas Robins, Jr., is acting as temporary chairman. Permanent officers will be elected after the acquisition of a plant.

The directors are: Robert B. Fiske, B. W. Henderson and S. C. Moody of American Cyanamid; David W. Bernstein and Robert Marcus of the American Biltrite Rubber Co.; Raymond Mills, Endicott-Johnson Corp.; John H. Matthews, Raybestos-Manhattan, Inc.; Hugh S. Ferguson, Dewey and Almy Chemical Co.; Thomas Robins, Jr., Hewitt-Robins Inc.; and Everett Morss, Simplex Wire and Cable Co.

The four groups of shareholders are as follows: Group I (three directors), comprised of companies manufacturing a wide diversity of rubber products, including industrial hose and conveyor belting, foam

### Alphabetical Listing of Bidders for the Government-Owned Synthetic Facilities

American Chemical Corp.
- Richfield Oil Corp.
- Stauffer Chemical Co.

American Synthetic Rubber Corp.
- American Biltrite Rubber Co.
- American Cyanamid Co.
- Anaconda Wire & Cable Co.
- Brown Rubber Co., Inc.
- Dewey & Almy Chemical Co.
- Dunlop Tire & Rubber Co.
- Endicott-Johnson Corp.
- Faultless Rubber Co.
- Hewitt-Robins Inc.
- General Cable Co.
- Goodall Rubber Co.
- Johnson Rubber Co.
- KYS Corp.:
  - Bata Shoe Co., Inc.
  - Bristol Manufacturing Co.
  - Converse Rubber Co.
  - Goodyear Footwear Corp.
  - Goodyear Rubber Co.
  - LaCrosse Rubber Mills Co.
  - Servus Rubber Co.
  - Tingley Reliance Rubber Co.
  - Tyer Rubber Co.
- Phelps Dodge Copper Products Co.
- Raybestos-Manhattan, Inc.
- Rome Cable Corp.
- Seamless Rubber Co.
- Simplex Wire & Cable Co.
- Sponge Rubber Products Co.
- Thermoid Co.
- Wooster Rubber Co.

Climax Molybdenum Co.

Copolymer Corp.
- Armstrong Rubber Co.
- Armstrong Rubber Manufacturing Co.
- Dayton Rubber Co.
- Gates Rubber Co.
- Mansfield Tire & Rubber Corp.
- Sears, Roebuck & Co.
- Seiberling Rubber Co.

Dow Chemical Co.
Esso Standard Oil Co.
Firestone Tire & Rubber Co.
Food Machinery & Chemical Corp.
Foster Grant Co., Inc.
General Chemical Div., Allied Chemical & Dye Corp.
General Tire & Rubber Co.

Goodrich-Gulf Chemicals, Inc.
- B. F. Goodrich Co.
- Gulf Oil Corp.

Goodyear Synthetic Rubber Corp.
- Goodyear Tire & Rubber Co.

W. R. Grace & Co.
Great Southern Chemical Corp.
Hercules Powder Co., Inc.
Heyden Chemical Corp.
Humble Oil & Refining Co.
Koppers Co., Inc.
Merck & Co., Inc.
Midland Rubber Corp.
Minnesota Mining & Manufacturing Co.
Monsanto Chemical Co.
Montrose Chemical Co.
J. G. Mulligan & Co.
National Lead Co.
Edwin W. Pauley

Petroleum Chemicals, Inc.
- Cities Service Co.
- Continental Oil Co.

Phillips Chemical Co.
- Phillips Petroleum Co.

Publicker Industries, Inc.

Shell Chemical Corp.
- Shell Oil Co.

Sinclair Refining Co.
Standard Oil Co. of Calif.
Texas Co.
U. S. Rubber Co.

and sponge rubber, tires, golf and tennis balls, rubber footwear, rubber tile, drug sundries and molded products—Brown Rubber Co., Inc., Lafayette, Ind.; Dewey and Almy Chemical Co., Cambridge, Mass.; Dunlop Tire and Rubber Corp., Buffalo, N. Y.; Faultless Rubber Co., Ashland, Ohio; Goodall Rubber Co., Trenton, N. J.; Hewitt-Robins Inc., Stamford, Conn.; Raybestos-Manhattan, Inc., Stratford, Conn.; Seamless Rubber Co., New Haven, Conn.; Sponge Rubber Products Co., Derby, Conn., and the Thermoid Co., Trenton, N. J.

Also the KYS Corp., which in turn, is composed of Bata Shoe Co., Inc., Belcamp, Md.; Bristol Manufacturing Co., Bristol, R. I.; Converse Rubber Co., Malden, Mass.; Goodyear Footwear Corp., Providence, R. I.; Goodyear Rubber Co., Middletown, Conn.; LaCrosse Rubber Mills Co., LaCrosse, Wisc.; Servus Rubber Co., Rock Island, Ill.; Tingley Rubber Co., Rahway, N. J., and Tyer Rubber Co., Andover, Mass. Fourteen of these companies are now in the Kentucky Synthetic Rubber Corp.

Group II, (three directors), comprised of four companies for whom Charles J. Johnson, president of Endicott-Johnson Corp., has acted as spokesman—American Biltrite Rubber Co., Chelsea, Mass.; Endicott-Johnson Corp., Endicott, N. Y.; Johnson Rubber Co., Middlefield, Ohio, and Wooster Rubber Co., Wooster, Ohio.

Group IV, (three directors), consists of the American Cyanamid Co., New York, N. Y., chemical manufacturer and marketing agent for synthetic rubber sold to consumers outside the American Synthetic Rubber Group.

### *Bids for Copolymer Plant*

The plant which the new corporation wishes to buy will be disclosed by the Rubber Producing Facilities Disposal Commission in Washington when sealed bids are opened following the final filing date of May 27th. American Synthetic Rubber has bid on one of the 13 copolymer plants.

The Rubber Facilities Disposal Act passed by Congress in 1953 emphasizes the importance of providing a place in the synthetic rubber program for companies outside the large tire manufacturers. Mr. Robins expressed the view that the American Synthetic Rubber Corp. provides an answer to this requirement. He added that the experience of the new group both in synthetic production and rubber fabrication should more than satisfy the government's requirement that purchasers have the technical competence to operate a rubber-producing facility. The combination of American Cyanamid's outstanding research facilities and background in petrochemicals research, with the group's plant operation know-how, gives reasonable assurance that American Synthetic, if it gets a plant, can contribute much to the future development and improvement of synthetic rubber, he said.

Sales of synthetic rubber for the month of August will show an increase of 22% over July sales according to an announcement released on May 20 by the Reconstruction Finance Corporation. August sales are estimated at 44,000 long tons with July sales now estimated at 36,000 long tons. This latter figure is 2,000 long tons higher than was estimated by RFC last April. Inventory adjustments by large customers who are required to place firm orders ninety days in advance of delivery may constitute part of the reason for the sharp increase in sales for August, RFC believes.

RFC's inventory of GR-S, including oil, as of April 30, 1954, was approximately 83,700 long tons. The following table sets forth an estimate of the government agency's production and sales for the three months' period ending August, 1954. These figures include the oil used in oil-extended rubbers, but exclude the carbon black used in carbon black masterbatches:

| Month | Production | Sales |
|---|---|---|
| June | 35,300 | 34,500 |
| July | 35,000 | 36,000 |
| August | 35,800 | 44,000 |

### *RFC Favored in Judgment*

In the May issue of RUBBER AGE, there appeared a report on a suit which had been filed by the School Board of Port Neches, Texas, against the Reconstruction Finance Corporation, in which it was contended that RFC was delinquent in payment of taxes from 1951 through 1953.

In a verdict returned by a jury hearing the case, it was ruled that the fair cash value of RFC's real property within the school district was $54,600,000 as of January 1, 1951; $53,200,000 as of January 1, 1952, and $47,600,000 as of January 1, 1953. It was reported that the School Board in seeking back taxes of $1,232,430 for the three years under consideration had placed a value of approximately $94,000,000 on the property.

After the verdict was returned, the District Court Judge hearing the case granted attorneys for both sides ten days to file briefs and motions for a judgment on the verdict. That judgment has now been handed down in favor of RFC. In his opinion, the Judge concluded that the School Board's assessment against the RFC property for each of the years in question is invalid. However, he said the judgment entered "should be without prejudice to the plaintiff's right to reassess the defendant's real property for each of the years in question in accordance with the laws of the State of Texas."

### SYNTHETIC FACILITIES OFFERED FOR SALE BY THE RUBBER PRODUCING FACILITIES DISPOSAL COMMISSION

#### Synthetic Rubber (GR-S) Plants

| *Present Operator* | *Location* |
|---|---|
| Copolymer Corp. | Baton Rouge, La. |
| Firestone Tire & Rubber Co. | Akron, Ohio |
| Firestone Tire & Rubber Co. | Lake Charles, La. |
| General Tire & Rubber Co. | Baytown, Texas |
| B. F. Goodrich Chemical Co. | Port Neches, Texas |
| B. F. Goodrich Chemical Co. | Institute, West Va. (In Stand-by) |
| Goodyear Synthetic Rubber Corp. | Akron, Ohio |
| Goodyear Synthetic Rubber Corp. | Houston, Texas |
| Kentucky Synthetic Rubber Corp. | Louisville, Ky. |
| Midland Rubber Corp. | Los Angeles, Calif. |
| Phillips Chemical Co. | Borger, Texas |
| U. S. Rubber Co. | Naugatuck, Conn. |
| U. S. Rubber Co. | Port Neches, Texas |

#### Butyl Rubber (GR-I) Plants

| | |
|---|---|
| Humble Oil & Refining Co. | Baytown, Texas |
| Esso Standard Oil Co. | Baton Rouge, La. |

#### Butadiene Plants—Petroleum

| | |
|---|---|
| Cities Service Refining Corp. | Lake Charles, La. |
| Copolymer Corp. | Baton Rouge, La. |
| Humble Oil & Refining Co. | Baytown, Texas |
| Neches Butane Products Co. | Port Neches, Texas |
| Phillips Chemical Co. | Borger, Texas |
| Sinclair Rubber, Inc. | Houston, Texas |
| Shell Chemical Corp. | Los Angeles, Calif. |
| Standard Oil Co. of Calif. | El Segundo, Calif. |

#### Butadiene Plants—Alcohol

| | |
|---|---|
| Carbide & Carbon Chemicals Co. | Louisville, Ky. (In Stand-by) |
| Koppers Co., Inc. | Kobuta, Penna. (In Stand-by) |

#### Styrene Plant

| | |
|---|---|
| Dow Chemical Co. | Los Angeles, Calif. |

#### Other Facilities

| | |
|---|---|
| U. S. Rubber Co. | Naugatuck, Conn. |

# INTERNATIONAL RUBBER STUDY GROUP HOLDS ELEVENTH MEETING IN CEYLON

The Eleventh Meeting of the International Rubber Study Group held in Colombo, Ceylon, concluded on May 11, listed among its actions the shelving of the buffer stock idea. There were no new suggestions for any other type of international commodity agreement. The natural rubber producing countries want an increase in the U. S. Government price for GR-S, but the U. S. delegation stood firm in opposition to this move. It was clearly pointed out that it is within the means and ability of each producing country to increase its efficiency in order successfully to compete with synthetic rubber in the world market.

Another result of the meeting was that American technical representatives will now have the opportunity of advising the natural rubber industry what they want from a technical standpoint. Better understandings have been reached through the recently concluded conference in Singapore, and confirmed at Colombo.

The Rubber Manufacturers Association, in reporting on the meeting, states that the interests of the American rubber manufacturer have not been compromised and the principles of free competitive and private enterprise were consistently presented by the U. S. delegation. This idea, says RMA, is not universally accepted in natural rubber producing territories, but arguments against these fundamental concepts were not convincing. The U. S. delegation also explained in considerable detail the new rotation procedures and the situation in respect to synthetic plant disposal. A good deal of interest was shown in these subjects by other delegations.

F. S. Amerasinghe, Permanent Secretary to the Ministry of Commerce, Trade and Fisheries of Ceylon, acted as chairman for the meeting. U. Sein Kyi, head of the Burmese delegation, and R. F. Bretherton, head of the United Kingdom delegation, were vice-chairmen for the meeting.

### *Delegates in Attendance*

Delegates from Australia, Belgium, British Colonial and Dependent Territories, Burma, Cambodia, Canada, Ceylon, Denmark, France, Federal Republic of Germany, Hungary, Indonesia, Italy, Japan, Liberia, Netherlands, Thailand, United Kingdom, United States of America, Viet-Nam and an observer from the International Rubber Development Committee attended the meeting.

SYNTHETIC RUBBER PRODUCTION
Estimated for 1954
*(in 1,000 long tons)*

| *Territory* | *Amount* |
|---|---|
| United States | 615(a) |
| Canada | 85 |
| Germany | 6 |
| Total | 706 |

(a) Including the oil content of oil-extended GR-S

According to the official report on the meeting issued by the International Rubber Study Group, the world statistical position was examined, and estimates made for natural and synthetic rubber production and consumption in 1954. It was estimated that the world production of natural rubber would be around 1,705,000 long tons, while production of synthetic rubber in member countries would be around 706,000 long tons. In regard to consumption, it was estimated that the world might consume 1,681,000 long tons of natural rubber and approximately 714,000 long tons of synthetic rubber, apart from the synthetic rubber produced in non-member countries. The balance of estimated production over estimated consumption of both natural and synthetic rubber amounted to only 16,000 tons which would be available for absorbtion into government and commercial stocks. The accompanying tables detail estimates made by the Rubber Study Group as to production and consumption of synthetic and natural rubber.

As at previous meetings, the Rubber Study Group was of the opinion that since transportation represented by far the largest potential use, the best way to stimulate greater use of rubber was by the improvement and extension of road systems.

Stress was laid on the importance of furthering, as intensively as possible, measures designed to strengthen the competitive position of natural rubber. The most important of these measures were replanting or new planting, as appropriate, with high-yielding material; the intensification of production research accompanied by exchange of information among all the organizations concerned in that work, and, on the side of research into consumption and the development of new uses, a closer liaison between those engaged therein and the consuming manufacturers. The Secretariat has been instructed to communicate these views to all appropriate bodies.

The Rubber Study Group noted that the recent Singapore Conference on Rubber Quality and Packing had been constructive and had resulted in a better appreciation of quality and packing questions between those engaged in the trade and industry in natural rubber in producing and consuming countries. It favored the holding of similar conferences from time-to-time in the future.

It noted with satisfaction that at the conference the principal world rubber trade associations had reached a compromise agreement whereby the 30 RMA Type Samples and the 7 Singapore Type Samples had been recognized as 37 Universal Type Samples but that the ultimate goal was still the elimination of overlapping. The Rubber Study Group also noted that, with the exception of two minor points, agreement on RMA packing specifications had been reached.

In regard to the use and development of technically classified rubber, the Rubber Study Group estimated that some 50,000 tons had been classified during 1953, showing a substantial increase over the previous years. It was appreciated, however, that this volume is still insufficient to achieve general acceptance of classified rubber.

NATURAL RUBBER PRODUCTION
Estimated for 1954
*(in 1,000 long tons)*

| *Territory* | *Amount* |
|---|---|
| Indonesia | 661 |
| Malaya | 575 |
| Ceylon | 96 |
| Thailand | 95 |
| Viet-Nam and Cambodia | 78 |
| British Borneo | 40 |
| Liberia | 37 |
| Belgian Africa | 25 |
| British Africa | 22 |
| Burma | 12 |
| French Africa | 3 |
| Other Countries | 61 |
| Total | 1,705 |

The Rubber Study Group came to a number of conclusions at the Colombo meeting, and these are summarized as follows:

### *Study Group Conclusions*

(1) Stabilization of the world's rubber markets at equitable prices remains the strong desire of all members of the Group. There was no consensus, however, as to the means by which stabilization was to be achieved nor as to the necessity for the buffer stock agreement nor for any other international commodity agreement at this time. Consequently, the Group did agree that the work done on the draft buffer stock agreement had been valuable and should be borne in mind in the event that the present balance between supply and demand was disturbed by unforeseen developments.

(2) As regards the short term remedies recommended by the Special Meeting of the Management Committee of the Group held in London last October, the Group noted the following points: (a) The rubber stockpile rotation practices of the United States Government were revised in December, 1953, and in May, 1954; (b) The United States was prepared to give sympathetic consideration to specific proposals directed to increased effort on the part of producers to plant or replant with high-yielding strains, to reduce costs, and otherwise to improve the efficiency of production and marketing. It was recognized that such measures could enhance the competitive position of natural rubber producers, but only in the long term, and (c) The United States Government had decided after careful examination that it had no grounds for altering the basis of its present pricing policy for GR-S.

(3) It was agreed that the price relationship between synthetic and natural rubber was of vital importance to rubber producers, especially in countries which were mainly dependent on the proceeds of their natural rubber exports for their economic welfare and development. Representatives of producing countries repeated that the

raising of the GR-S price as requested at earlier discussions in the Group would have facilitated their efforts to re-equip their industry and expressed their regret that this had not been done. Even at this late stage an increase in the price would be of material assistance in encouraging planting and replanting on a scale adequate to put their industry on a more competitive footing and to meet probable world demand.

All natural rubber producing countries represented at the meeting, with the sympathy of several consuming countries, both large and small, strongly urged the United States delegate to transmit to his government a request to reconsider whether, in the light of the views expressed above, the government could not see its way to revising the present price of GR-S in an upward direction.

In agreeing to transmit this request to his government, the U. S. delegate stated that he could not support it because, in his view, the outlook for rubber consumption was such that the natural rubber industry could be developed satisfactorily without an artificial or arbitrary increase in the price of GR-S.

(4) In view of the importance which it attaches to the relationship between synthetic rubber and natural rubber, the Rubber Study Group decided to entrust the Management Committee with the specific task of keeping the relationship between the synthetic and natural rubber prices under close and continuous scrutiny, and instructed it to draw the attention of member governments to any important change in the situation.

Australia, British Colonial and Dependent Territories, Burma, Ceylon, France, Indonesia, Liberia, Netherlands, the United Kingdom and the United States of America will be members of the Management Committee for the coming year. The Rubber Study Group also decided to accept the invitation of the Government of Liberia to hold its next annual meeting in Monrovia at a date to be decided later.

ESTIMATED NATURAL AND SYNTHETIC RUBBER CONSUMPTION IN 1954

*(in 1,000 long tons)*

| *Territory* | *Natural* | *Synthetic** | *Total* |
|---|---|---|---|
| United States | 620 | 615(a) | 1,235 |
| United Kingdom | 214 | 11 | 225 |
| France | 112 | 16 | 128 |
| Federal Republic of Germany | 109 | 11 | 120 |
| Japan | 84 | 3 | 87 |
| Canada | 38 | 35(a) | 73 |
| Italy | 45 | 10 | 55 |
| Australia | 35 | .. | 35 |
| Belgium | 20 | 1 | 21 |
| Netherlands | 18 | 1 | 19 |
| Denmark | 6½ | ½ | 7 |
| Other Countries | 379½ | 10½ | 390 |
| Total | 1,681 | 714 | 2,395 |

* Excluding Russian produced synthetic rubber. (a) Including oil content of oil-extended GR-S.

### Offers Data on Morpholine

Characteristics and applications of a new chemical possessing seemingly endless uses are described in detail in a technical bulletin on morpholine published by the Jefferson Chemical Co., New York, N. Y. The bulletin reports that morpholine, its derivatives, and compounds find employment as emulsifiers, vulcanization accelerators, antioxidants, plasticizers, solvents, viscosity improvers, and as gelling, softening, and separating agents. The bulletin describes the product as a colorless hydroscopic liquid, with amine-like odor. It is derived from hydrocarbon sources. Its solvent power is said to exceed that of benzene, pyridine, and dioxane. Completely miscible with common organic solvents, it dissolves organic materials such as resins, dyes, waxes, shellac, and cascin. The comprehensive bulletin, available on letterhead request to the company, incorporates data on the product's physical and chemical properties, uses and potential applications, and presents vapor pressure, specific gravity, viscosity, surface tension, and other curves.

### Pittsburgh PX-118 Plasticizer

"Pittsburgh PX-118," an isooctyl decyl phthalate plasticizer said to provide lower volatility and a higher degree of permanence than DOP, is now available from the Plasticizer Division of the Pittsburgh Coke and Chemical Co., Pittsburgh, Penna. The new plasticizer gives outstanding performance in high temperature processing cycles and in calendering and coating operations involving the exposure of large surface areas. Vinyl products containing the material are characterized by long life and an excellent resistance to extraction by various materials. Pittsburgh PX-118 also has good electrical properties that make it ideal for use in electric wire and cable, the company states. Initially, plastisols prepared with the product are approximately equal in viscosity to DOP, but they are characterized by superior viscosity stability. In general, the material is compatible with all resins for which DOP is satisfactory. With a specific gravity of 0.973 plus or minus 0.002 at 25/25°C., the product is available in tank cars, tank truck and 55 gallon drums.

### Koroseal Bulb Syringes

A line of Koroseal bulb and feminine syringes, first ever made of plastic, has been introduced by the B. F. Goodrich Co. Industrial Products Division. The new Koroseal bulbs flex thousands of times more than ordinary bulbs, according to Robert W. Nickels, manager of the Sundries Sales Division. Mr. Nickels said that the new bulbs have non-absorbent smooth interiors, resist medicine and oil deterioration and have a brilliant, smooth finish that cleans easily. Four models of the new feminine syringes, available in red or white Koroseal, have a diffused spray pipe, round adjustable shield and protective cap. Two "Stowaway" models, also in red or white Koroseal, have retractable pipes of flexible Koroseal. Koroseal bulbs also feature the company's new line of ear and ulcer syringes, infant syringes, nasal aspirators, rectal bulb syringes, breast pumps and household syringes.

### U. S. Royal 8 Automobile Tire

U. S. Rubber Co., New York, N. Y., has announced a new automobile tire that gives 25% more mileage and which does not squeal or hum. Howard N. Hawkes, vice-president and general manager of the Tire Division, says the new tire incorporates the greatest advances in performance and appearance since the introduction of the extra low pressure tire in 1947. Called the "U. S. Royal 8," the tire was specifically engineered for both tube and tubeless construction, and both types will be available immediately from coast to coast. "We have reason to believe," Mr. Hawkes said, "that the tubeless version will be original equipment on several 1955 automobiles."

Extra mileage has been achieved, Mr. Hawkes said, partly through the tread design, which has an improved distribution of the tread rubber. The tread "footprint" of the U. S. Royal 8 is almost rectangular. This places relatively more rubber on the road than other tires with ovalized footprints, and improves traction and breaking. To eliminate annoying tire squeal and hum, "we reversed the usual tread design," Mr. Hawkes explained, "by putting the narrowest rib at the outside edge. Motorists can now turn corners with no fear of screeching tires." Another advantage of the new tire, he added, is easy steering. The wide center rib helps provide easy rolling and steering. Electronic measurements show that less shock reaches the steering wheel and passengers, thus insuring more riding comfort. Safety slots are nearly the full depth of the tread to give skid resistance, and the outer grooves are dog-leg in shape to cast off small stones that shorten tire life. Resistance to ruptures has been increased about 16%, Mr. Hawkes stated.

In conformance to modern style trends, the customary "gingerbread" has been removed from the sidewall, leaving a cleaner and smoother look. Whitewall models have the narrow white sidewall originated by U. S. Rubber. The U. S. Royal 8 is in the regular non-premium price range. Prices of the tubeless tire will be roughly equivalent to the tube tire version plus the tube itself.

# ELASTOMER-PLASTICS GROUP HOLDS THIRD ANNUAL SHORT TALKS SYMPOSIUM

On May 18, the Elastomer and Plastics Group of the Northeastern Section, American Chemical Society, held its Third Annual Short Talks Symposium at the Massachusetts Institute of Technology in Cambridge, Mass. Charles S. Frary, Jr. (Boston Woven Hose), acted as chairman for the symposium. The titles of the papers presented at the symposium and their authors, follow:

"Recent Developments in the Waterproof and Canvas Shoe Industry" by Bernard H. Capen, Tyer Rubber Co., Andover, Mass.

"Blocking Tester for Flexible Sheet Materials" by R. E. Hubbard, Dennison Manufacturing Co., Framingham, Mass.

"New Antioxidants for GR-S" by Irving Kahn, Plastics and Adhesives Branch, Ordnance Materials Research Office, Watertown Arsenal, Watertown, Mass.

"Specialty Polymer Latices" by Max Taitel, Union Bay State Chemical Co., Cambridge, Mass.

"Determination of Tackiness of Rubberlike Polymers Using the Du Nuoy Tensiometer" by Donald Wright, Hood Rubber Co., Watertown, Mass.

In his paper on "Recent Developments in the Waterproof and Canvas Shoe Industry", Mr. Capen spoke mostly on the interest created by the cast or slush molded plastisol insulated boots, as well as the line of rubber (latex or calendered) shoes such as the Korean boot, sporting boots, and the introduction of dress gaiters and rubbers using sponge insulation.

### *Determination of Tackiness*

Mr. Wright, in his paper on "Determination of Tackiness of Rubberlike Polymers Using the Du Nuoy Tensiometer", stated that the instrument under discussion has been adapted to the measurement of tackiness of GR-S, Butyl, neoprene, natural rubber and other polymer compounds. This has been done with reference to standard films of GR-S or natural rubber prepared by evaporating solvent solutions in petri dishes.

The speaker explained that thin rectangular or cylindrical specimens of the sheeted compounds are carefully prepared and suspended from the beam of the tensiometer from which the tension ring is usually suspended. A rectangular specimen usually measures 1.5 mm. by 6.5 mm. in cross-section and is about 20 mm. long. This is suspended so that the whole cross-sectional area will contact the reference film when the suspension arm is lowered five scale divisions and the zero point is reached. After 3 seconds dwell, the arm is gradually raised at a prescribed speed. Scale readings for the separation are noted. These can be calculated into dienes per square cm. of cross-section, the speaker stated.

Mr. Wright observed that this procedure has give a reasonable degree of reproducibility. All tests were made at room conditions. Variations in contact pressures and dwell periods were not studied, he said. Results were shown for the tackiness of blends of GR-S and natural rubber in varying proportions, of various early production sources of GR-S, of a few other polymers, and a number of tackifiers when tested in typical GR-S footwear upper compounds. This technique, he concluded, should also be applicable to latex film.

In his paper on "New Antioxidants for GR-S", Mr. Kahn presented the highlights on the development of several new antioxidants in GR-S. The investigation used N,N'-di-sec. butyl-p-phenylene-diamine as a starting point because it was considered the best specific inhibitor for ozone as a result of extensive testing. This chemical, however, had two disadvantages: high vapor pressure which permitted escape during milling and vulcanizing operations, and vapors which caused skin irritation to some people.

A series of homologues were synthesized and tested. It was found that as the molecular weight increased, the vapor pressure decreased, and the migration mobility of the chemical was slowed in its path to the surface of the rubber. In some specific cases, this mobility had to be accelerated by use of small amounts of wax.

Optimum side chain length, in comparison to N,N'-di-sec. butyl-p-phenylene-diamine was found to be in the region between six to ten carbon atoms to produce the best balance between migration rate and mobility. These chemicals are extremely effective at three parts per 100 GR-S and are superior to those currently on the commercial market. At present, however, the cost of these chemicals is slightly higher than that of the commercial inhibitors.

The Universal Oil Products Co., Des Plaines, Illinois, is currently producing pilot lot quantities of several of the more promising ones. Ordnance believes that this development will alleviate a problem which has long confronted the whole Department of Defense and the rubber industry, Mr. Kahn stated.

Max Taitel, in his paper on "Specialty Polymer Latices", stated in developing a specialty polymer latex, the basic concept is applied that the properties of such a latex should be ideal in the specific application for which it is designed. For example, a modified polystyrene type (Ubatol U-2001) is specifically designed for use in self-polishing floor finishes; a modified polyacrylate type (Ubatol U-3010) is specifically designed for use in the top finishing of leather.

Mr. Taitel noted that the dispersion systems and manufacturing processes for each of these two types are carefully controlled. As a result, three key properties are imparted to the latices:

(1) Extremely small particle size. Electron microscope studies indicate the order of magnitude to be 0.03 microns. This permits air-dried films to attain high gloss.

(2) Excellent stability, including superior freeze-thaw resistance in the case of modified polystyrene.

(3) Excellent water resistance of air-dried films.

The modified polystyrene and modified polyacrylate latices have already stimulated interest in other coatings and impregnation problems where their properties could be very useful; for example, fiberglass, paper, and linoleum coatings.

Specialty polymer latices specifically designed for much different applications are in process of development. For example: experimental copolymers are being evaluated in such applications as upholstery-backing, and the production of artificial suede. In these fields, it is expected that specialty polymer latices will eliminate complex curing systems, reduce curing times and temperatures, and will improve water and abrasion resistance, Mr. Taitel declared.

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### A. E. Juve Named to UN Group

Arthur E. Juve., manager of compounding research at the B. F. Goodrich Research Center, Brecksville, Ohio, has been named a United States rubber standards representative to the International Standards Organization of the United Nations. The UN standards group will hold meetings in London, England, from June 28 to 30, which Mr. Juve will attend. Mr. Juve was named to the rubber standards assignment by the American Standards Association which coordinates technical standards in the United States. He is a graduate of Ohio State University and has been with Goodrich since 1925. He is the author of a number of technical articles in the field of rubber technology and is currently a nominee for the position of vice-chairman of the Division of Rubber Chemistry, American Chemical Society, for 1955.

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### Colloid Symposium Planned

The chemistry of television screen manufacture, the role of chemical adsorption in photography, and studies of the detailed structure of reclaimed rubber will be three of the topics reported in scientific sessions of the 28th National Colloid Symposium, to be sponsored by the American Chemical Society's Division of Colloid Chemistry on Thursday, June 24, at the Rensselaer Polytechnic Institute. Professor Herman F. Mark, internationally known authority on fibers, plastics and rubber and director of the Polymer Research Institute in the Polytechnic Institute of Brooklyn, will present the main address of the symposium at a dinner on Friday night, June 25. Dr. Mark's subject will be "Recent Developments in Polymer Research."

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### Canadian Reprint Available

Reprints of an article from *Chemistry in Canada*, on the "Rubber Products Industry of Canada," are now available. This 11-page article outlines the story of the rubber products industry in Canada from its background to its personnel. Topics covered in detail include: Rubber Products, Rubber and Plastics, Exports and Imports, Raw Materials, Rubber, Reinforcing Agents, Rubber Chemicals, Other Chemicals, Production Techniques, and Research and Development. Copies are available without charge from the Chemical Institute of Canada, 18 Rideau Street, Ottawa 2, Ontario.

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## 1953 PRODUCTION AND SALE OF RUBBER CHEMICALS INCREASES

The United States Tariff Commission has released preliminary statistics on United States production and sales of rubber-processing chemicals in 1953. This release, the second in a series giving preliminary statistics on 1953 production and sales of synthetic organic chemicals, gives statistics on rubber-processing chemicals by principal uses—accelerators, antioxidants, and peptizers.

United States production of rubber-processing chemicals in 1953 was 145,000,000 pounds, an increase of 14% over the 127,000,000 pounds reported for 1952. Sales in 1953 totaled 103,000,000 pounds, valued at $60,000,000, compared with 94,000,000 pounds, valued at $54,000,000, in 1952. The larger 1953 production and sales resulted from an increase in the consumption of rubber.

The output in 1953 of cyclic rubber-processing chemicals totaled 122,000,000 pounds, compared with 108,000,000 pounds in 1952. Sales of these compounds in 1953 were 85,000,000 pounds, valued at $48,000,000, compared with 78,000,000 pounds, valued at $42,000,000, in the previous year. Cyclic rubber-processing chemicals are chiefly accelerators and antioxidants.

The production in 1953 of acyclic rubber-processing chemicals, chiefly accelerators and peptizers, was 23,000,000 pounds, compared with 19,000,000 pounds produced in 1952. Sales in 1953 totaled 18,000,000 pounds, valued at $12,000,000, compared with 17,000,000 pounds, valued at slightly less than $12,000,000, in 1952.

The statistics on total production and sales of rubber-processing chemicals given in the accompanying table are more than 95% complete. The complete statistics will be given in the Commission's final report, which will be issued later.

Copies of the section on rubber-processing chemicals, may be obtained by writing to the United States Tariff Commission, Washington 25, D. C.

UNITED STATES PRODUCTION AND SALES OF RUBBER PROCESSING CHEMICALS—1953

| Chemical | Production (1,000 lbs.) | Sales Quantity (1,000 lbs.) | Sales Value (in $1,000) | Unit Value[a] (per lb.) |
|---|---|---|---|---|
| **Rubber Processing Chemicals—Cyclic** | | | | |
| Accelerators | | | | |
| Butryaldehyde-aniline | 374 | 333 | 187 | $0.56 |
| Guanidines | 6,167 | 5,206 | 2,620 | .50 |
| Thiazole Derivatives | | | | |
| 2,2'-Dithiobis [benzothiazole] (2,2'-Benzothiazyl disulfide) | 14,860 | 10,053 | 4,609 | .46 |
| 2-Mercaptobenzothiazole | 15,915 | 2,745 | 1,069 | .39 |
| All Other | 21,994 | 11,176 | 5,925 | .53 |
| All Other Accelerators | 1,703 | 1,381 | 2,152 | 1.56 |
| Total Accelerators | 61,013 | 30,894 | 16,562 | .54 |
| Antioxidants | | | | |
| Amino or hydroxy compounds | 23,893 | 22,419 | 12,756 | .57 |
| All Other | 31,638 | 27,847 | 14,804 | .53 |
| Total Antioxidants | 55,531 | 50,266 | 27,560 | .55 |
| Peptizers, tackifiers and inhibitors | 4,988 | 4,335 | 3,470 | .80 |
| Total Rubber Processing Chemicals—Cyclic | 121,532 | 85,495 | 47,592 | .56 |
| **Rubber Processing Chemicals—Acyclic** | | | | |
| Accelerators | | | | |
| Dithiocarbamic acid derivatives[b] | | | | |
| Dibutyldithiocarbamic acid, zinc salt | 766 | 637 | 600 | .94 |
| Diethyldithiocarbamic acid, zinc salt | 1,278 | 1,038 | 977 | .94 |
| Dimethyldithiocarbamic acid, potassium salt | 145 | 125 | 63 | .50 |
| All Other | 4,084 | 1,114 | 1,017 | .91 |
| Tetramethylthiuram sulfides[c] | | | | |
| Tetramethylthiuram disulfide | 4,719 | 2,995 | 3,214 | 1.07 |
| Tetramethylthiuram monosulfide | 747 | 785 | 886 | 1.13 |
| All Other[d] | 4,420 | 3,850 | 2,117 | .55 |
| Total Accelerators | 16,159 | 10,544 | 8,874 | .84 |
| Peptizers, lubricating and conditioning agents | | | | |
| Dodecyl mercaptans | 6,118 | 6,413 | 3,244 | .51 |
| All Other | 975 | 769 | 345 | .45 |
| Total Peptizers | 7,093 | 7,182 | 3,589 | .50 |
| Total Rubber Processing Chemicals—Acyclic | 23,252 | 17,726 | 12,463 | .70 |
| Grand Total Rubber Processing Chemicals—Cyclic and Acyclic | 144,784 | 103,221 | 60,055 | $0.58 |

Notes: [a] Calculated on rounded figures. [b] Data for dithiocarbamates included in this table are for material used exclusively in the processing of natural and synthetic rubbers. [c] Includes data for small amounts of tetramethylthiuram sulfides for uses other than in the processing of natural and synthetic rubbers. [d] Includes a small amount of tetramethylthiuram tetrasulfide.
Source: U. S. Tariff Commission.

### To Vote on Merger Plan

The boards of directors of Mathieson Chemical Corp. and Olin Industries, Inc., have voted unanimously to submit to their stockholders at special meetings on June 29, 1954, a proposal to merge the two companies. The announcement was made jointly by John M. Olin, president of Olin Industries, and Thomas S. Nichols, president and chairman of Mathieson. The name of the new company will be Olin Mathieson Chemical Corp. Following the merger, Mr. Olin will become chairman of the board of Olin Mathieson and Mr. Nichols will become president. Mr. John W. Hanes will become chairman of the finance committee. Based on 1953 figures, the combined corporation will have total assets of about $500,000,000 and sales of over $500,000,000, including sales of non-consolidated subsidiaries and licensees.

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### Mare Island Anniversary

Against the dramatic background of silent vessels of war and the towering cranes and machines that built them, a majestic parade of ships will salute the achievements of a century this fall as Mare Island Naval Shipyard, Vallejo, Calif., commemorates one hundred years of service to the United States fleet. This parade of ships, to light up the straits between Mare Island and its parent township of Vallejo each of the four nights of the Centennial, September 16 through 19, will be the highlight of the celebration planned. The Rubber Laboratory at the Shipyard is only one of the many individual installations and offices which will take part in the ceremonies. The list of distinguished guests invited to participate in the ceremonies is headed by President Eisenhower and includes high-ranking federal and state officials as well as famous members of the United States armed forces.

### NSC Cites Reclaiming Plant

Two National Safety Council awards for accident free operation have been made to Processing Plant No. 2 of the U. S. Rubber Reclaiming Co., at Cheektowaga, N. Y., company officials announced recently. The first award, a Certificate of Commendation, was given in recognition of plant operation from June 23, 1952, to December 31, 1953, without a single accident. Such certificates, U. S. Rubber Reclaiming said, were awarded to only three other rubber units out of 130 evaluated. The second award to the Cheektowaga plant was in the form of a plaque for accident free performance in the division in which the plant is classified. Of nearly 9,000 plants surveyed by the NSC, fewer than 15% received awards.

Joy Manufacturing Co., Pittsburgh, Penna., has released a new bulletin on Joy Series 100, Class WN-114 heavy-duty air compressors for industry. Ask for Bulletin A-72.

## FINAL PROGRAM DETAILS SET ON LONDON RUBBER CONFERENCE

The Institution of the Rubber Industry, under whose auspices the Third Rubber Technology Conference will be held at the Church House in London, England, June 22 through 25, has made available additional information on the program and other activities. The Conference will be attended by M. E. Lerner, editor of RUBBER AGE, and a complete report on the meeting, prepared by Mr. Lerner, will appear in the July, 1954, issue of this journal.

I. R. I. states that fifty separate papers will be discussed in the field of developments in natural rubber, the production and use of synthetic rubber, the chemistry and physics of rubber, investigations into the compounding of rubber, developments in methods of testing, and a group of miscellaneous items which include fiber problems with rubber and the influence of high energy radiations on rubber. Discussions will take place at sessions in the morning and afternoon.

Other activities planned for the Conference include a government reception at Lancaster House on June 22. On June 23 there will be a reception at the Savoy Hotel, sponsored by Cyanamid Products, Ltd. On June 24, Dunlop Rubber Co., Ltd., will sponsor another reception at Claridge's Hotel. I. R. I., on June 25, will give a cocktail party and banquet at the Trocadero Restaurant in Picadilly, London.

It has also been announced that an exhibition of new testing equipment, developed since the last Conference, which took place in 1948, will be held at Church House during each day of the Conference.

Admission to the discussion on the various papers will be open to members of the Conference only. The demonstration of testing instruments will be open to Conference members and holders of invitation tickets. Admission to the evening functions is on a restricted invitation basis.

Members of the conference will each receive a preprint of all papers to be discussed. The subject matter of these papers is somewhat specialized in the field of fundamental research, but a short 100-word non-technical summary of each paper will be available, if required.

### Producing Silicone Nipples

Pyramid Rubber Co., Ravenna, Ohio, is producing a line of baby nursing bottle nipples made of silicone rubber. After making many tests of silicone rubber in its own laboratories, the company is now making their "Evenflo" nipples in silicone as well as in natural rubber. The new "Evenflo Deluxe Silicone Nipples" will withstand repeated boiling temperatures indefinitely. They are not affected by fats and oils normally present in milk and baby formulas. They have a soft, smooth feel and are entirely tasteless and odorless, the company states. Pyramid states that in spite of the advantages inherent in silicone rubber, it is believed that most nipples will continue to be made of natural rubber, which costs but a fraction as much as silicone rubber.

### Australian Rubber Supplies

A four-point plan to expand the Papua and New Guinea rubber industry has been announced by the Australian government. At present, the two territories produce about 3,000 tons of rubber a year, supplying 10% of Australia's rubber needs. Now, the government plans to boost production by opening up new areas for rubber plantations, stepping up research, replanting with high-yield trees, and improving methods of preparing rubber for market. The government is acting on the advice of the Rubber Research Institute of Malaya. Some Australian government officials believe that New Guinea and Papua can produce rubber "equal to the world's best."

### Appoints Two Sales Managers

The Chemical Division of the General Tire & Rubber Co., Akron, Ohio, has announced the appointment of two new sales managers. L. W. Reeves has been named manager of chemical sales, supervising the sale of products manufactured at the company's plant at Mogadore, Ohio. George Hackim has been appointed manager of vinyl resin sales, handling the resins produced at the firm's new $6,000,000 plant at Ashtabula, Ohio. Both Mr. Reeves and Mr. Hackim will make their headquarters in Akron. Mr. Reeves, associated with the Chemical Division since 1951, previously was associated with the Hooker Electrochemical Co., Dayton Rubber Co., and the Binney & Smith Co. He is a graduate of Cornell University with a degree in electrical engineering and is a member of the American Chemical Society and the Akron Rubber Group. Mr. Hackim has been with the company since 1948. A native of Akron, he is a graduate of the University of Akron with a B.S. degree in chemistry. He is a member of ACS, the Society of the Plastics Industry, and a number of local rubber groups.

### DuBois Develops Dura-Lube

A completely new type of saponaceous surface lubricant for rubber, almost 100% non-foaming in itself, without addition of chemical defoamers of any kind, has just been announced under the name of "Dura-Lube" by the DuBois Co., Inc., of Cincinnati, Ohio. This material is suitable for use as stock dip or spray or for any other rubber surface applications where the method of use has caused foaming problems in the past, and where in some cases it has not been permissible to use any of the conventional defoaming agents as additives. DuBois believes that the standard Latex-Lube and Liqui-Lube products will continue to be the ones in major demand for most applications, but that this highly specialized material, manufactured from totally different raw materials, will find a demand in occasional batch-off or spray operations where foaming has been definitely troublesome.

## U.S. RUBBER ANTI-TRUST SUIT TERMINATES IN CONSENT DECREE

The government's anti-trust suit against the U. S. Rubber Co. and the Dunlop Rubber Co., Ltd., was brought to a close with the filing of a consent judgment on May 28 in Federal Court, New York City. The government's complaint against the two companies was begun on December 16, 1948.

The Justice Department had charged the two firms with "unreasonable restraints" of foreign and interstate commerce in the production and sale of natural latex, various latex products and rubber thread and elastic yarn.

In addition, the government alleged that the two firms engaged in price fixing and cross-licensing agreements, and the pooling of foreign patents that were licensed on exclusive and restrictive terms. Also, the government charged U. S. Rubber and Dunlop with forming a "world-wide cartel" supported by a system of jointly-owned companies and by allocation of such trade marks as "Lastex."

These "objectionable" agreements, the Justice Department declared, are terminated by the consent judgment and are prohibited in the future. Other alleged activities of the two firms, such as price fixing and division of territories, are also barred by the decree, the government said.

The decree also requires U. S. Rubber and Dunlop to make their patents available on a reasonable royalty basis, and to dissolve one of the jointly-owned companies. As to the other companies owned by U. S. Rubber and Dunlop, the consent judgment divided them into two groups, those in one group to be managed by U. S. Rubber, and the other to be run by Dunlop.

In New York, U. S. Rubber stated that it still does not consider it has violated the anti-trust laws in this case. However, the company said it has joined in the consent decree, since it would be less costly to revise its methods of conducting its foreign elastic thread business in a manner to satisfy the government than to contest the contest in a court trial.

### NXP Super Nylon Truck Tire

Goodyear Tire & Rubber Co., Akron, Ohio, has introduced the "NXP Super Nylon" truck tire, a new type, high capacity nylon tire which is said to carry heavier loads than regular truck tires and to do a better job than tires of wire cord construction. The NXP Super Nylon will have a new size marking to distinguish it from conventional type tires. Primary advantage of the new tire design, the company said, is a reduction in the weight and size of the tire, tube and wheel assembly, with an increase in carrying capacity. The tire is designed to meet the specific requirements of truck operators seeking to boost the cubic-foot capacity of their trailers while remaining within present over-all dimensional limits. Experiments conducted with a large West Coast fleet operator proved the new Goodyear NXP Super Nylon to be far superior to many other types tested, including tires using wire cord construction, the company stated.

## AMERICAN VISCOSE REVEALS DEVELOPMENT OF NEW RUBBER

Shareholders of the American Viscose Corp. at a recent annual meeting in Philadelphia, Penna., were told of "Filastic," a new type of rubber still in the experimental stage. Dr. Worth Wade, assistant to the president and head of the Patent Development Department, reported that the process for making the material was discovered in a "sleeper paragraph" in a Viscose patent issued in 1946 but heretofore unused. The firm is now in the process of reviewing its unused patents to see what commercial items they contain.

Filastic is produced by breaking down raw natural rubber into fiber form and reconstituting it into a web-like formation in which the fibers are locked wherever they cross. It can be produced in very thin sheets, or in heavy thicknesses like sponge or foam rubber.

The product is said to provide great porosity, elasticity, flexibility, and considerably greater strength than conventional foam rubber. A quarter-inch thick sheet is so porous that tobacco smoke can be blown through it almost as readily as through a sieve, Dr. Wade demonstrated. It is strong enough to be sewed or stapled at the edges and hold firmly.

Potential markets for the new product are as "breathing" insoles for shoes, acoustical paneling, non-slip under-pads for carpets, surgical bandages, corsets and girdles, etc. In heavier sizes, the material will be strong enough for conveyor belting. As a rug backing, it can readily be washed or dry cleaned with the rug. Combined with conventional foam rubber, it makes a sturdy, pre-formed rolled edge for mattresses.

Emphasizing that Filastic still isn't formally in the pilot plant stage, Frank H. Reichel, chairman and president, said American Viscose must soon decide whether to manufacture the material or license others, probably rubber companies, to do it. He indicated that if rubber companies desired licenses to produce, it was likely that American Viscose would grant them. One spokesman for the company stated that Filastic is about a year away from commercial markets.

No actual cost comparisons of Filastic with other rubber products are available as yet, an American Viscose official stated.

### Revises Latex Specifications

The Technical Service Branch of the Sales Division, Office of Synthetic Rubber, Reconstruction Finance Corp., Washington, D. C., has announced new specifications for GR-S latices X-617, X-667 and X-711. The specifications for the Mooney viscosities of the contained polymers have been removed for these latices. OSR states that this was necessary as it has been found that in all determinations of Mooney viscosities for these latices, the samples have slipped, cracked, tore or crumbled in the viscometer, and although readings were obtained the results had no true value. Adequate steps have been taken, however, to assure that consumers will continue to receive the same high quality latices as in the past.

## GOODRICH INDUSTRIAL PRODUCTS DIVISION PROMOTES FITZ AND BALTZ

Raymond L. Fitz

Robert E. Baltz

The B. F. Goodrich Co. Industrial Products Division has announced the promotion of Raymond L. Fitz to production superintendent of Plants 1 and 2 in Akron, Ohio, while Robert E. Baltz has been named processing production manager of the division. A graduate of the University of Dayton as a chemical engineer, Mr. Fitz joined the company in 1940 as a member of the works technical laboratory. He became a shift foreman in the reclaim plant in 1940 and became a general foreman in 1944. In 1946, Mr. Fitz was made production manager of the Calendering Departments of the Processing Division. In 1950, he was appointed production superintendent in the Processing Division, in charge of rubber preparation, compounding, mixing, milling and Calendering Departments at Plants 1 and 4. Mr. Fitz is a member of the Ohio Society of Professional Engineers.

Mr. Baltz has been with the company since 1929, starting as a factory employee. He became a floor foreman when he was transferred to the Industrial Products Division in 1940. In 1946, he became a general foreman in the General Molded Goods Control Department, and in 1951 was named production manager of the miscellaneous departments of the Industrial Products Division. In 1953, Mr. Baltz became project manager of latex thread at the company's Plant 4 in Akron. He is a graduate in economics of the University of Akron.

### Davison and Grace Merged

Merger of the Davison Chemical Corp. into W. R. Grace & Co. was approved by stockholders of the former company on May 13. The stockholders of W. R. Grace & Co. voted their approval on May 12. Davison will operate as Davison Chemical Co., Division of W. R. Grace & Co., with headquarters in Baltimore, Md. The present board of directors of Davison will continue as members of an advisory board of the Davison Division, and present officers of the company will continue in corresponding posts of the new Division. Officers will be: Chester F. Hockley, chairman of the advisory board; M. G. Geiger, vice-chairman of the advisory board and president; P. W. Bachman, vice-president; D. N. Hauseman, vice-president; W. B. McCloskey, vice-president; M. C. Roop, vice-president and secretary; C. E. Waring, vice-president; W. N. Watmough, Jr., vice-president; J. S. Marks, treasurer; F. J. Griffin, controller; F. Z. Oles, assistant controller; and R. S. Clark, assistant secretary.

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### Linde Building Silicone Plant

A contract for initial construction work on its proposed silicone-producing plant at Long Reach, West Virginia, has been awarded to Baker and Coombs, Inc., of Morgantown, West Virginia, according to an announcement by Linde Air Products Co., a division of Union Carbide and Carbon Corp. Work was expected to start at the approximately 1,400-acre plant site about June 1. The initial contract covers grading; construction of driveways, a parking area, and a siding from the B&O Railroad line; installation of a water supply system; and erection of several buildings. The buildings will include an office and laboratory building, maintenance building, locker building, and a gatehouse building which will house the plant dispensary. Work will start at the site of the former Johnson property near Sugar Camp Run. Linde has been producing silanes and silicones for several years at a pilot plant at Tonawanda, New York. Such Linde products as silicone water repellent for above-grade masonry, electrical insulating varnishes and resins, mold release agents, silicone rubber gum stock, asbestos shingle water repellent, and electrical wire enamel are now being introduced to industry.

## WASHINGTON GROUP HEARS EVANS ON MODERN PASSENGER CAR TIRE

The April 21 meeting of the Washington Rubber Group was held in the auditorium of the Potomac Electric Power Co. Building in Washington, D. C., and was attended by approximately 60 members and guests. Principal speaker at the meeting was R. D. Evans, tire design engineer of the Goodyear Tire & Rubber Co., who spoke on "The Modern Passenger Tire Has Become an Ever Increasing Refinement of Compromises."

The Nominating Committee announced at the meeting that it had completed the selection of a slate for the coming election of the group. Members nominated for office included: *President*, Paul Greer (O.S.R.); *Vice-President*, W. James Sears (RMA) and L. A. Schlueter (NPA-Chemical Division); *Secretary*, Arthur Schröder (NPA-Compressed Gas Section) and William Dunkle (Goodyear); *Treasurer*, Ethel Levene (Bureau of Ships) and Frank Rupert (Army Engineer Research and Development Laboratories). Rachel J. Fanning (NBS) and John R. Britt (Bureau of Ships) were nominated for the post of recording secretary.

### *Pre-Pearl Harbor Construction*

Mr. Evans began his talk by describing briefly some pre-Pearl Harbor tire cord construction and listed the requirements of a good tire cord, among which are low gravity, material strength, weight, gage, and elongation. Expanding on this theme, the speaker discussed the increased demand for high speed tires which Pearl Harbor and war had brought forth, and outlined how the requirements for a good tire cord were affected by this demand.

This portion of Mr. Evan's talk was illustrated with slides which showed several interesting factors: (1) Tires with nylon cords are 6% stronger than those with rayon cords; (2) The burst psi of cotton is 360, of rayon 480, and of nylon 590, and (3) A nylon cord tire will carry 28% more weight of airplane than a rayon cord tire.

The speaker told of the current changes in tire construction and the two factors causing these changes: (1) Increasingly smoother roads, permitting higher pressures with average comfort, and (2) high speed using more pressure. This, said Mr. Evans, is a reversal of the trend to low pressure in tires.

Mr. Evans listed six factors which the purchaser of a tire looks for: (1) A long span of life for the tire; (2) Soft and quiet ride; (3) Fast stopping; (4) Good steering; (5) Integrity of construction for high speed, and (6) Low tire drag. Mr. Evans in listing these six items clearly pointed out that it is impossible to produce a tire with all these features as some of them are completely incompatible. Thus, he stated, the modern passenger tire has become "an ever increasing refinement of compromises."

The speaker illustrated his talk with slides dealing with such items as tire behavior and riding features, comparisons of stopping ability on wet asphalt and ice, comparison of steering force to slip angle in dry weather, wet weather, snow, and ice, the relationship of temperature build-up to tire size, and finally the effect of inflation on tire performance.

Mr. Evans predicted an optimistic future for tire development. Fibers will be produced which will surpass nylon, he stated. Polymer chemists will offer new elastomers with even lower hysteresis. Tires in the future are going to be safer, more durable, more comfortable to ride on and will give much better value per dollar of expenditure.

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Krene plastic is being used by the Bilnor Corp., Brooklyn, N. Y., in the manufacture of a new line of wading pools which can be inflated by attaching a vacuum cleaner hose to the valves of the three individually inflated air chambers around the pool.

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U. S. Rubber is now producing its Elastic Naugahyde plastic upholstery in a new modern two-tone design called "Contemporary."

## Coming Events in the Rubber Industry

**June 18.** Akron Rubber Group, Summer Outing, Firestone Country Club, Akron, Ohio.

**June 18.** Boston Rubber Group, Summer Outing.

**June 18.** Washington Rubber Group, Annual Outing, Prince Georges Country Club.

**June 22-25.** Institution of the Rubber Industry, Third Rubber Technology Conference, London, England.

**June 25.** Detroit Rubber & Plastics Group, Summer Outing, Hillcrest Country Club, Mt. Clemens, Mich.

**Aug. 3.** New York Rubber Group, Golf Tournament, Baltusrol Golf Club, Springfield, N. J.

**Aug. 20.** Philadelphia Rubber Group, Cedarbrook Country Club, Mount Airy, Philadelphia, Penna.

**Sept. 15-17.** Rubber Division, A.C.S., Fall Meeting, Hotel Commodore, New York, N. Y.

**Sept. 16-20.** Scrap Rubber & Plastics Institute, National Association of Waste Material Dealers, Inc., Sagamore Hotel, Bolton Landing, N. Y.

**Sept. 18.** Connecticut Rubber Group.

**Sept. 23.** Southern Ohio Rubber Group, Fall Technical Meeting.

**Oct. 5.** Buffalo Rubber Group, Westbrook Hotel, Buffalo, N. Y.

**Oct. 5.** Los Angeles Rubber Group, Statler Hotel, Los Angeles, Calif.

**Oct. 8.** Detroit Rubber & Plastics Group, Detroit-Leland Hotel, Detroit, Mich.

**Oct. 15.** Boston Rubber Group, Fall Meeting, Hotel Somerset, Boston, Mass.

**Oct. 22.** New York Rubber Group, Fall Meeting, Henry Hudson Hotel, New York, N. Y.

**Nov. 3.** Los Angeles Rubber Group, Statler Hotel, Los Angeles, Calif.

**Nov. 12.** Philadelphia Rubber Group, Dinner Meeting, Poor Richard Club, Philadelphia, Penna.

**Nov. 18.** Rhode Island Rubber Club, Fall Meeting.

**Dec. 3.** Los Angeles Rubber Group, Xmas Party, Ambassador Hotel, Los Angeles, Calif.

**Dec. 8.** Buffalo Rubber Group, Xmas Party, Buffalo Trap and Field Club, Williamsville, N. Y.

**Dec. 10.** Boston Rubber Group, Xmas Party, Hotel Somerset, Boston, Mass.

**Dec. 10.** Detroit Rubber & Plastics Group, Sheraton Cadillac Hotel, Detroit, Mich.

**Dec. 10.** New York Rubber Group, Xmas Party, Henry Hudson Hotel, New York, N. Y.

**Dec. 18.** Southern Ohio Rubber Group, Xmas Party.

### Nylon Tire Repair Units

Nylon tire repair units, said to be lighter and stronger than comparable rayon units, are being introduced into tire shops across the country by the Seiberling Rubber Co., Akron, Ohio. Although the new two-ply nylon units are actually 50% lighter than those made of rayon, extensive tests in actual use prove them to be stronger than four-ply conventional rayon patches, the company states. The nylon units are recommended for low pressure tires, since their lightness lessens the "thump" which sometimes results with heavy rayon units. A major problem of tire repair—edge separation—has also been reduced with the new units by making the nylon patches with saw-tooth edges. The company points out that this design increases the total edge length and distributes stress, stretch and flexing over a greater area. Five of the new units are now available for low pressure tires, and nylon truck repair units will be on the market in the near future, the company said.

## PHILADELPHIA HEARS SEEGER DELIVER TALK ON CHEMIGUM SL

Approximately 125 members and guests of the Philadelphia Rubber Group attended the April 30th meeting held at the Poor Richard Club in Philadelphia, Penna. Featured speaker at the meeting was Dr. N. V. Seeger of the Goodyear Tire & Rubber Co., who delivered a paper on "The Isocyanate Rubbers". In his talk, Dr. Seeger described "Chemigum SL," Goodyear's new polyester rubber. He stated that Chemigum SL is an elastomeric polyesterurethane made by reacting a linear alkyd resin with a diisocyanate.

Condensation polymerization, he stated, proceeds until a raw gum is produced which has many of the characteristics of pale crepe. Cured Chemigum SL is chemically similar to Vulcollan recently announced by Dr. O. Bayer of the Farbenfabriken Bayer Co. of Leverkusen, Germany. Raw materials are ethylene glycol, propylene glycol and adipic acid which are condensed to a low molecular weight polyester. The polyester in turn is chain extended with one or more of several diisocyanates preferably derived from benzidine, 1:5 napthalene diamine, 4:4' diamino diphenyl methane, and 2,4 tolylene diamine.

The raw polymer can be compounded in a manner similar to hydrocarbon rubbers. Additional di or polyisocyanate is added on the mill. A cured gum vulcanizate can be obtained by molding under pressure giving physical properties comparable to natural rubber tread stock. Typical properties are: tensile 5000 lbs./sq.in., elongation 750%, abrasion resistance twice as great as rubber, excellent heat resistance, outstanding oxidation resistance, and oil resistance equivalent to Neoprene. No sulfur is used as a curative, since no unsaturation exists in the polymer, he stated.

Potential uses include wear-resistant tread veneers on passenger and truck tires. Solid tires made from Chemigum SL have given service four to five times longer than conventional solid tires. Soles, heels, belt surfaces, floorings, etc., may be protected by the localized application of wear resistant SL's, the speaker observed.

The raw gum is soluble in a variety of solvents such as methyl ethyl ketone, chlorinated aliphatics and esters. Thus these polymers lend themselves to cement compounding and rubber cement applications. A solution of Chemigum SL sprayed on the surface of rubber or plastic gives an adherent, flexible and scuff resistant coating which is at the same time resistant to sunlight, ozone, and general weathering.

A new elastomeric polyester-isocyanate foam has recently been announced by Goodyear. The new product exhibits the properties of solid Chemigum SL, namely, resistance to grease and oils, excellent resistance to oxidation and sunlight, and high ratio of compression to density, Dr. Seeger concluded.

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What is said to be one of the largest silicone rubber window gaskets ever made has been molded by Bacon Industries for the Climatic Laboratory of the U. S. Army Quartermaster and Development Center at Natick, Mass.

## Named to Technical Sales Staff

Kenneth H. Irons

Harwick Standard Chemical Co., Akron, Ohio, has announced the appointment of Kenneth H. Irons to its technical sales staff in Akron. Mr. Irons was formerly with the Ohio Rubber Co., Willoughby, Ohio, as chemist on raw materials inspection and control, new products compounding and development, and factory compounding molded goods. Mr. Irons received his bachelor's degree in chemistry from Westminster College, New Wilmington, Penna., in 1939. He joined the Koppers Co., Tar and Chemical Division, in 1941, serving in research and development of coal-tar by-products until called into the Army Air Corps. At the close of the war he was employed by the Gates Rubber Co., Denver, Colo., in the raw materials control laboratory, where he served until joining Ohio Rubber in 1947. He is a member of the American Chemical Society, Rubber Division, and the Akron Group.

## GSA Reports Recap Savings

According to Edward F. Mansure, Administrator of General Services, recapping civilian vehicle tires is saving the Federal government an estimated $1,000,000 annually. Mr. Mansure bases his estimate on definite reports he has received from the six-state Chicago region. In the six central states there are 11,713 civilian government motor vehicles. In the last 12 months 24,300 tires of all sizes were recapped at a cost of $130,000 in round figures. New tires would have cost about $125,000 more. In previous years the total recapping came to less than $1,000 annually for this region, Mr. Mansure says. The GSA buys tires at considerably less than they cost the retail-buying citizens because of quantity contracts and no excise taxes. It gets its recapping done, also, at a considerably reduced figure. The average public cost of recapping a 6:00x16 tire is $10.50. Snow treads for that size come to $12.10. Under new contracts now being let, because of sharp competition for the business, Uncle Sam's discounts run as high as 52%. Civilian federal agencies using the vehicles contract in any of the cities in which they operate for tire service and the recappers make their reports to the GSA regional offices.

## BUFFALO-ONTARIO MEETING HEARS BUGBEE ON OUTLOOK

The joint meeting of the Buffalo Rubber Group and the Ontario Rubber Section of the Chemical Institute of Canada held on May 14 at the Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, heard an interesting address by H. G. Bugbee, president of the Natural Rubber Bureau, Washington, D. C. Mr. Bugbee spoke on "The Present World Rubber Situation and the Future Outlook for Rubber." The Buffalo-Ontario joint meeting represented the 13th Annual International Meeting of the groups. Over 200 members and guests attended the meeting.

In his address, Mr. Bugbee stated that the Natural Rubber Bureau estimates that 1,700,000 tons of natural rubber will be produced in 1954, and 750,000 tons of synthetic, making for a grand total of 2,450,000 long tons. It is also estimated that 1,620,000 long tons of natural will be consumed, and 760,000 long tons of synthetic making for a total of 2,380,000 long tons.

It will be noted, said the speaker, that in looking at the figures for 1954 that there is an excess of production over consumption. This was also true in 1953, and this discrepancy will probably continue at least through 1955 and perhaps through 1956. From that point on a closer balance between production and consumption is anticipated. There will also be a continuing upward trend in both demand and supply.

Mr. Bugbee observed that by 1962 there will be some 3,350,000 long tons of new rubber produced, including 2,200,000 long tons of natural and 1,150,000 long tons of synthetic. In justifying this estimate, insofar as natural rubber is concerned, Mr. Bugbee pointed to current and past replanting programs which should reach fruition by 1962. By that time, he stated, Malaya may well produce 725,000 long tons, Indonesia, 925,000 long tons, and the rest of the world, 550,000 long tons.

Insofar as the relationship between natural and synthetic rubber is concerned, Mr. Bugbee believes that in 1954, natural rubber will constitute 48% of the total new rubber consumed. Furthermore, the upward trend in favor of natural should continue as long as the present price relationship between the two rubbers does not change markedly.

In other parts of his address, Mr. Bugbee considered the research which is now going on in the field of natural rubber both in production and as to use. He paid particular attention to the uses to which natural rubber has been put in paving work and outlined some current activities in this direction.

## QM Rubber Section Moves

The Rubber Section of the Quartermaster Corps, U. S. Army, formerly located in Washington, D. C., has been moved to Natick, Mass. Personnel involved in the move to Natick include Juan Montermoso, Jean Lewis, Jim Connor, Gilbert Arons and Russell Walkey.

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## "RUBBER ABSTRACTS" REPORTS ON CURRENT PUBLISHING ACTIVITIES

The Research Association of British Rubber Manufacturers, Shawbury, Shrewsbury, Shropshire, England, has compiled some interesting information on the history and current status of *Rubber Abstracts*, said to be the most comprehensive abstract journal in the world in the field of natural and synthetic rubbers and rubberlike plastics. Now in its thirty-second year of publication, it was formerly known as the "Summary of Current Literature." The title of the publication was changed in 1952 to the more descriptive *Rubber Abstracts*.

The journal is compiled by a team of university graduates who form part of the staff of the Intelligence Division of RABRM. These persons read regularly the more than 300 journals received regularly by the Association's library and make abstracts of articles of interest to any aspect of the rubber field. These journals include the rubber journals of the world, many of the plastics journals, and the more important publications in the fields of pure and applied chemistry and physics, textiles, and electrical engineering. In addition, numerous abstract journals are scanned for articles of interest appearing in journals other than those received.

The coverage in the patent field is also world wide. British and American patents are abstracted by the RABRM staff from the complete specifications. Commonwealth patents from the patent journals of the different countries are also covered. Patents of European countries are examined by Rubber-Stichting in Holland and the Institut Francais du Caoutchouc in France, and by agreement between these organizations and RABRM, abstracts are exchanged.

Thus, every month over 1,000 abstracts on every aspect of the industry, including planting, science, technology and economics, pass through the hands of RABRM. The more important of these, about 500, are selected for monthly publication in *Rubber Abstracts*.

Each abstract is classified according to its subject and the abstracts arranged in classification order for publication. Thus, all abstracts relating to natural rubber latex, or GR-S, for example, will be found together. This means that the user of *Rubber Abstracts* can turn at once to the section of particular interest to him.

The basis of classication is the system devised in 1930 by the late T. R. Dawson, who, for many years, was head of the RABRM Intelligence Division. This system has been revised and brought up-to-date from time-to-time, and now has an international standing, being controlled by the International Committee for Classification on Rubber Information (ICCRI) with the Secretariat at Delft, Holland.

In addition to being given a classification number which is printed at the end of each abstract, each abstract has a serial number. The serial numbers begin with each year and are useful for identification purposes and for the preparation of a subject index which appears annually, along with name and patent indexes. If required, copies can be supplied printed on one side of the paper, only, for cutting up and pasting on to index cards.

RABRM states that the wide appeal of the journal is shown by the fact that 32 countries are represented on its list of subscribers. The subscription rate for the United States is $62 a year, including postage. This sum also includes the index.

## Low Visits United States

Ralph LaPorte, chief chemist of the Seiberling Rubber Co., Akron, Ohio, is shown below exhibiting some compounding materials to Dr. Rodolfo Low (left), chief chemist of Productos De Caucho Villegas, S. A., a firm recently organized to make

Seiberling tires in Bogota, Colombia. Also seen in the photograph is Sam Roudebush, plant manager of the Colombian company. Dr. Low plans to spend six weeks in the United States studying compounding and developing processes.

## Shortage of Rubber in Brazil

According to reports from Brazil, paralyzation of all rubber processing industries looms unless the government takes immediate steps to circumvent a shortage of natural rubber in the market. Three large factories in Sao Paulo announced they will have to close their doors. Pirelli closed its rubber manufacturing department recently. Goodyear announced its closing on June 6 and Firestone was to have closed on June 8. The national rubber production being insufficient to cope with the ever-growing needs of the rubber manufacturers, the rubber industries combined and asked the government some time ago to grant them licenses to import synthetic rubber. For unexplained reasons these licenses were not granted. According to law, the Executive Commission of Rubber Defense is obliged to look after the supply of rubber to local manufacturers, to maintain a close check of existing stocks and to take steps to see that there are enough stocks to meet local demands. It seems it did not carry out these provisions and manufacturers are now placing responsibility for the shortage on the shoulders of that commission, demanding immediate steps be taken. Rubber workers number several thousands in Sao Paulo and Rio de Janeiro.

## BASCOM ADDRESSES CONNECTICUT ON RUBBER AND PLASTIC BLENDS

The Spring Meeting of the Connecticut Rubber Group was held on May 13 at Tierman's Homestead, Savin Rock, West Haven, Conn. Principal speaker for the meeting was Roger Bascom of the B. F. Goodrich Chemical Co., Cleveland, Ohio, who spoke on "Blends of Rubber and Plastics." The meeting also featured an announcement from the Nominating Commitee as to the members who have been nominated for office for 1955. Ward E. Fisher (Armstrong Rubber), vice-chairman of the group in the current year of 1954, will assume the chairmanship in 1955. Other members nominated for office include:

*Vice-Chairman*, James R. Boyle (Armstrong Rubber) and Rial S. Potter (MB Manufacturing); *Secretary*, Warren Hess (U. S. Rubber) and John A. Brazee (Whitney Blake); *Treasurer*, Harry Gordon (Bond Rubber) and Arnold Pfenninger (Connecticut Hard Rubber). In addition, B. M. Fairbanks (G-E), Warren Carter (Pequanoc Rubber), Otto Lang (KBC Industries), and Edward J. Geiss (Naugatuck Chemical) were nominated as directors for 1955.

In his paper, Mr. Bascom stressed the importance of the blending of rubber and plastics to the individual chemist, in that a great deal can be accomplished in the blending that would enable the individual's company to realize great savings if applied in the proper manner.

It was explained, in brief, that the blending of rubber and plastics since the early 1920's has come a long way in a highly important development. A blending with high styrene resins has proven a great boon to reinforcement, elongation, abrasive resistance and long flex life. The importance of this point is emphasized when an observation is made of the shoe soling industry, which is concentrating on this type of blend.

Mr. Bascom showed what could be done with the blending of high styrene resins and rubber phenolic resins and nitro rubber, polyvinyl chloride resins with nitro rubber and the effects of flexing of PBC latex and nitro latex. He also pointed out that the intermediate problems involved in the blendings of rubber and plastics are great. Through concentrated effort, however, these problems can be solved in a net result of good, economical compounds.

Following Mr. Bascom's paper there was a short question and answer period. The meeting was attended by approximately 130 members and guests of the Connecticut Rubber Group.

## Bulletin on Latex Facilities

An impressive brochure outlining its latex service for southern industry has been issued by the Southern Latex Corporation of Austell, Georgia. The brochure contains full size photographs of the company's plant at Austell and of the executive, manufacturing and sales personnel. Shipping facilities are emphasized, including tank cars, trailers and trucks. Doug C. Cochran is president of the Southern Latex Corporation.

## STATUS OF RUBBER INDUSTRY SUBJECT OF NEW NCO REPORT

The National Credit Office, New York, N. Y., in a recent review of the rubber manufacturing industry, stated that 1953 shipments of passenger car and truck tire casings totaled 94,617,000, representing a 10.8% increase over the 1952 figure of 85,346,000. Production also increased so that inventories at year end rose to 15,720,000 as compared to 14,110,000 the year earlier, according to the Rubber Manufacturers Association. Consumption of natural and synthetic rubber in the United States for the year was 1,330,000 long tons. In 1952 the figure was 1,261,000 long tons as indicated by the U. S. Department of Commerce. By comparison, the year was the best in the history of the industry from a tire production standpoint and second only to 1950 for shipments. Labor relations were good with relatively few work stoppages.

The future prospects for rubber products manufacturers are fundamentally tied to those of the entire economy. The estimates for 1954 by some of our well known economists and advisers predict approximately a 4% decline in our national production. Proposed capital expansion (a very popular guide for forecasters), is estimated at a figure almost exactly this amount below the 1953 level. Individually, the rubber manufacturing industry is expected to produce fewer original equipment tires in 1954 in line with a predicted decline in new cars produced. However, replacement tire production should continue at a high level reflecting the record number of vehicles produced in recent years, NCO observed.

Estimated cars and trucks currently in operation exceed 54,000,000, an all-time high. Over 25,000,000 of these are between 3 and 9 years old, according to Wards Automotive Reports. Other, non-tire segments of the industry will probably show a decline, especially in defense business, but recent diversification by many major producers into plastics, foam rubber and non-related lines should have a strong stabilizing effect, the NCO said.

### *Preliminary 1954 Figures*

Preliminary figures for the early months of 1954 show the predicted decline in evidence. Combined natural and synthetic rubber consumption for the first two months was 192,427 long tons, down 18% from the same period in 1953, according to the Rubber Manufacturers Association.

Material costs should remain relatively stable during the year but other expenses threaten to cut profit margins. On the labor front, the policy committee of the United Rubber Workers, C.I.O., has announced a "substantial" wage increase and a guaranteed annual wage as major 1954 goals. With the reduction in government contracts there will be greater emphasis on competition to obtain the available civilian business. This will probably result in higher advertising and selling budgets. On the other side of the picture there is the recently completed and still continuing modernization and improvement programs of many producers which will serve to reduce factory and handling expenses.

Opinions vary as to what will happen when the government owned synthetic rubber plants are sold to private industry. One guess is that the price of synthetic rubber will go up at first but will be reduced later. Rubber brokers are handling only a small amount of this business now and will probably not suffer, or benefit, materially from the changeover, NCO observed.

There is little expectation that the banner results of 1953 will be duplicated. On the other hand, no one will deny that both 1951 and 1952 were good years for the industry. Even if volume and profits for 1954 should decline to the levels of either of these prior years, the final results will naturally have to be classified as good, NCO concluded.

## LAMB AND ELDER ELECTED VICE-PRESIDENTS OF ADAMSON UNITED CO.

H. P. Lamb

N. J. Elder

Election of two new officers was recently announced by the Adamson United Co. of Akron, Ohio. H. P. Lamb has been elected vice-president and manager of project engineering, while Norman J. Elder has been elected vice-president and manager of the Calender Division. Mr. Elder was graduated from the University of Akron as a mechanical engineer in 1941. He served with the U. S. Navy in World War II. Before joining Adamson in 1946, he was with the B. F. Goodrich Co. and the Morse Instrument Co. Mr. Elder started with Adamson in an engineering capacity and later became manager of production and sales of calenders and calender accessories as well as Rotocure machines. Mr. Lamb was graduated from Penn College in electrical engineering. Starting with the Ohio Rubber Co. in 1935, he came to Adamson in 1939 as an automatic control specialist. He has been manager of project engineering since 1946. This position included the production and sale of mills, vulcanizers, and hydraulic equipment. He was also engaged in special projects including Dynamometers and brake and tire testing equipment.

### Quaker Rubber Promotes Murken

The appointment of Walter Murken as production manager of the Quaker Rubber Corp., a division of the H. K. Porter Co., Inc., Philadelphia, Penna., was recently announced. In his new position, Mr. Murken will be responsible for the planning and scheduling of all plant production facilities. Mr. Murken studied business administration at the University of Pennsylvania, and has served Quaker Rubber in various capacities over the past 16 years. Previous to this promotion, he was district sales manager for the Philadelphia area.

### Goodrich Granted Patent

The sixth patent granted to the B. F. Goodrich Co., of Akron, Ohio, covering another basic feature of tubeless tires, has been issued by the U. S. Patent Office. The most recent patent going to the company, inventor of tubeless tires, covers an improved inner liner which adheres to the inside surface of tires without use of adhesives. The patent was granted in the name of Donald V. Sarbach, of Cuyahoga Falls, Ohio. Mr. Sarbach is technical manager of the company's New Products Development Department. Patents issued to the company in 1952 covered the tire's airtight lining; the air and pressure sealing ridges that lock the tire to the wheel, and the sealant that heals punctures while tubeless tires are in actual road service. Earlier patents on other features of the tubeless tire are also held by Goodrich, which introduced the tire in 1947 and has produced and sold more than 3,000,000 tubeless tires since then.

Adhesive Products Corp., New York, N. Y., has developed a new transparent adhesive for adhering metallized plastic. Called "No. 3799 Metgrip," the adhesive does not cause the metallic finish to peel or run when used on metallized acetate, butyrate or polystyrene.

### Armstrong Rubber Expands

Armstrong Rubber Co. has announced the construction of a new building covering 50,000 square feet at its plant in West Haven, Conn. The company recently purchased new production equipment and in a general modernization procedure revamped its production line. Every department involved in tire manufacture has been affected, many moving from one floor to another to provide better straight line flow. New type truck tire building machines are being installed to provide capacity for building truck tires of the type used on giant earth moving equipment. With the addition of passenger tire building machines combining many new principles, the passenger tire department has also expanded. New slab cooling units and a new heavy-duty Banbury with a water-cooled, 1,000 hp motor are innovations in the Milling Department. Other equipment includes better and larger tread tubers and cooling units; a 300 ton tank for storing and conveying carbon black to the Banbury; an automatic conveyor that transports tires to and from the curing room; a larger latex fabric dipping machine that will handle more tension; a new air compressor to take care of the increased demands of the new equipment, and a new sub-station which will consolidate and distribute electric power. The additional facilities which the new building and equipment provides will raise the annual production of the West Haven plant from the present 52,000,000 pounds a year to 60,000,000 pounds a year.

### Mobay Chemical Incorporated

Incorporation of the Mobay Chemical Co., jointly owned by Monsanto Chemical Co., St. Louis, Mo., and Farbenfabriken Bayer, A.-G., of Leverkusen, Germany, was announced recently. The new company, which is equally owned by the parent companies, will manufacture isocyanate compounds. David L. Eynon has been elected president of Mobay Chemical. Until recently, Mr. Eynon has been assistant to a vice-president of Monsanto. He joined Monsanto in 1933 and has served in research, production and executive administration positions. Directors of Mobay Chemical are Mr. Eynon, John L. Gillis of St. Louis, Dr. Oskar Loehr of Leverkusen, Edward M. Pflueger of New York City, and J. Russell Wilson, also of St. Louis. Temporary headquarters of Mobay are with Monsanto Chemical at St. Louis. No decision has been made as to the size or location of the isocyanate plant.

### Makes £165,000 Donation

Sir Frank Beaurepaire, founder and chairman of the board of the Olympic Tyre & Rubber Co., Victoria, Australia, has made a donation of £165,000 (about $370,000) to the University of Melbourne to build a modern sports center. Sir Frank is a famed Olympic swimmer, and is one of the men responsible for getting the 1956 Games for Melbourne. He was Lord Mayor of the City of Melbourne from 1940 to 1942 and is still a member of the City Council.

### Brubaker To Head New Division

Harry M. Brubaker

Announcement has been made by the Witco Chemical Co., New York, N. Y., of the election of Harry M. Brubaker as vice-president in charge of the newly-created Witco Rubber Chemicals Division. Mr. Brubaker joined Witco in 1951 as assistant sales manager of the Carbon Black Division. He was formerly associated with the B. F. Goodrich Co., Phillips Chemical Co., and the Sid Richardson Carbon Co. Headquarters of the new Witco Division will be located at Akron, Ohio. The Division will cooperate with Witco's 11 sales offices and will be responsible nationally for sales to the rubber industry of carbon black, Sunolite anti-sunchecking wax, M. R. (hard hydrocarbon), and softeners.

### Sun Licenses Mexican Firm

Pretty soon youngsters below the Rio Grande will be able to get Donald Duck, Mickey Mouse and the whole family of Walt Disney toys produced by the Sun Rubber Co., Barberton, Ohio. A licensing agreement has been worked out by the Barberton firm with Novidades Plasticas, S. A., of Mexico City. The Mexican company has been granted the right to use Sun's patents, techniques and processes for cast vinyl plastic products. These include any of Sun's toys and dolls. Novidades Plasticas is known as one of Mexico's leading injection molders in the toy field. Plans already are under way to add some new dolls for this specialized market, president T. W. Smith, Jr., of Sun Rubber, reports. Robert D. Thompson, foreign licensing representative for Sun Rubber, directed the negotiations with the Mexican firm.

### Naugatuck Moves Sales Office

The New York area sales office for the Naugatuck Chemical Division of the U. S. Rubber Co. has been moved from 254 Fourth Ave. to the parent company's headquarters at 1230 Avenue of the Americas, New York 20, N. Y. The office, which services the New York metropolitan area—including northern New Jersey—handles sales of latex, Lotol compounds, Marvinol vinyl resins, Kralastic molding powders, Vibrin polyester resins and Sealz compounds.

### Foster Honored by Goodyear

E. J. Thomas, president of the Goodyear Tire & Rubber Co., recently unveiled a plaque in ceremonies held in Akron, Ohio, which named the world's largest conveyor belt press for H. D. Foster, manager of the company's Industrial Products Division. In the ceremony, Mr. Thomas commended Mr. Foster for his 40 years of service and outstanding achievement. It marked the first time in the history of the company that an employee was thus honored. The plaque inscription reads, "The Judge Foster Press, named by E. J. Thomas, president, in honor of Homer D. 'Judge' Foster, manager industrial products division, to commemorate his forty years of loyal service and outstanding achievements with Goodyear." Some 50 associates witnessed the dedication, including Russell DeYoung, vice-president in charge of production; R. S. Wilson, vice-president in charge of sales; and W. S. Wolfe, factory manager. Mr. Foster, who completed 40 years' service several months ago, was instrumental in the development and installation of the belt press. Approximately 42 feet in length, the press is 82 inches wide and capable of vulcanizing conveyor belts up to 72-inches in width. Including accessory units, it covers an area of some 2,500 square feet, weighing in excess of 600,000 pounds.

### Opportunity for Presentations

One of the special functions performed by the Liaison Committee of the Rubber Division, A.C.S., is cooperation with the local rubber groups, including aid in the preparation of programs. Frequently, a supplier of rubber machinery and equipment or of chemicals and compounding materials has a story to tell to these groups, but is at a loss as to the method of approach. The Liaison Committee bridges the gap in this instance by supplying a special bulletin from time to time to program chairmen of the local groups listing some of the papers which are available for presentation. Accordingly, suppliers who would like to have papers presented before the local rubber groups should indicate such wishes to the vice-chairman of the Rubber Division who also functions as chairman of the Liaison Committee. The present vice-chairman is John M. Ball, Midwest Rubber Reclaiming Co., Millstone Road, R.R. 1, Wilton, Conn.

### Anaconda Gets Swedish Mill

A Swedish-made $1,000,000 all-automatic wire-rolling mill has been completed for the Anaconda Wire and Cable Co. at Great Falls, Mont., which ordered it last January. Makers are Svenska Metallverken (Swedish Metal Works Co.), which has made a similar rolling mill for France and is operating two others in Sweden. The 275-ton mill is being brought to Stockholm from Vaesteras in 120 crates on fifteen freight cars. Goeran Waenerlund, chief engineer of Svenska Metallverken, said a team of Swedish workers was going to Great Falls to put up the mill. He thought it should be running by the end of the year.

## SYMPOSIUM ON O-RINGS WILL FEATURE ASME SESSION

The semi-annual meeting of the Rubber and Plastics Division of the American Society of Mechanical Engineers will be held on Tuesday, June 22, at the William Penn Hotel in Pittsburgh, Penna. It will be held in conjunction with the meeting of the parent society. Allan Gifford, of the Lord Manufacturing Co., Erie, Penna., is chairman of the division.

Two sessions will be held, one in the morning on plastics and the other on rubber in the afternoon. The rubber session will feature a Symposium on O-Rings, consisting of three papers, as follows: (1) Designing with O-Ring Seals, by David R. Pearl, Hamilton Standard Division, United Aircraft Corp., Windsor Locks, Conn.; (2) Compounding Principles Involved in the Production of O-Rings, by D. S. Messenger, Garlock Packing Co., Palmyra, N.Y., and (3) Swelling and Drying of Fuel O-Rings, by R. A. Clark and R. M. Kell, Battelle Memorial Institute, Columbus, Ohio. Walter Tepper, of the Martin Rubber Co., will act as chairman for this session, with Edward T. Wandered, of the Aluminum Co. of America, as vice-chairman.

The plastics session in the morning will feature three papers, as follows: (1) Dielectric Fatigue Properties of Thermosetting Laminates, by N. A. Skow of the Synthane Corp.; (2) Impact Thermosetting Plastics with Responsibilities, by Paul E. Fina of the Fiberite Corp., and (3) Weather Aging of Styrene and Phenolic Plastics, by C. H. Adams and J. R. Taylor of the Monsanto Chemical Co. Maurice Morton, of the University of Akron, will act as chairman of the plastics session, with Daniel T. Downes, of the Pittsburgh Plate Glass Co., as vice-chairman.

In addition to the programs outlined above, the Rubber and Plastics Division is co-sponsoring with the Production Engineering Division a program on safety which will also be held during the morning of June 22. This program will constitute a Panel on Engineering Safety or "How the Engineering Approach is Solving Tough Safety Problems in Industry."

### H. O. Canfield Building Plant

Eighteen months of negotiations with the Clifton Forge Development Corp., Clifton Forge, Va., have culminated in an agreement whereby the H. O. Canfield Co. of Bridgeport, Conn., will construct and operate a factory at nearby Iron Gate, Va., for the manufacture of rubber products. To be built on a 17-acre tract at Iron Gate, the new plant will be operated as a subsidiary of H. O. Canfield and will be known as the Virginia Rubber Co. The Canfield company was to have started construction on the new $500,000 building comprising some 40,000 square feet in May. Production is expected to begin next fall and it is expected that within the next five years the plant will employ about 500 persons. The Clifton Forge Development Corp. was founded in 1950 to secure industry for the area.

### Gibbons Announces Retirement

Dr. Willis A. Gibbons

Dr. Willis A. Gibbons, associate director of research and development, has retired from the U. S. Rubber Co. after more than 41 years of service. Dr. Gibbons came to the rubber company directly after receiving his doctorate at Cornell in 1912. Except for a period of service in the U. S. Army during World War I, his entire active business career was spent with U. S. Rubber. He was a pioneer in the company's scientific research and development and later for the commercial development of rubber products and processes derived from applications of latex technology. His major developments include latex dipping of tire cord, a new test for vulcanization, a new method of vulcanization, and the manufacture of rubber thread and other products directly from latex. He was named director of research of the company in 1928 and until 1946 directed the company's constantly growing program of research in the fields of rubber, rubber chemicals, textiles, plastics and synthetic rubber. He had been associate director of research and development since 1946.

Dr. Gibbons served in World War I from 1917 to 1919. In 1916 he was included in the first group of reserve officers to be appointed in the newly formed Officers' Reserve Corps, accepting a commission as first lieutenant in the Coast Artillery. He was called to active duty in 1917 and was appointed assistant military attache to the American Embassy, London, England, being promoted later that year to the rank of captain. During 1918-1919 he served as captain in the Ordnance Department in Washington. During World War II he was a member of the technical committee of the Office of Rubber Reserve, and was also appointed by the Rubber Director as a member of the four-man American rubber mission sent to the Soviet Union to study their synthetic rubber processes. He also served on various advisory committees appointed by the National Research Council.

## BUREAU OF MINES REPORTS 8% RISE IN BLACK SALES

According to a recent report by the U. S. Bureau of Mines, sales of carbon black in 1953 rose 8% to 1,559,000,000 pounds from the 1,447,182,000 pounds sold in the previous year. These figures include export sales of 292,908,000 pounds in 1952 and 358,620,000 pounds in 1953, leaving domestic sales at 1,154,274,000 pounds in 1952 and 1,200,871,000 in 1953.

In 1953, 1,133,594,000 pounds were sold to rubber companies, against the 1,074,545,000 pounds sold to rubber companies in the preceding year. This means that of all domestic sales of carbon black in 1953, 94.4% went to rubber companies, while in 1952, 93.1% went to rubber companies.

In 1953, a total of 1,610,437,000 pounds of carbon black were produced including 453,345,000 pounds of channel black and 1,157,092,000 pounds of furnace black. In 1952, 1,604,102,000 pounds were produced, including 563,597,000 pounds of channel black and 1,040,505,000 pounds of furnace black.

At the end of 1953 there were 410,284,000 pounds of carbon black on hand, including 236,352,000 pounds of channel and 173,932,000 pounds of furnace. At the end of the preceding year, there were 359,350,000 pounds on hand, including 235,571,000 pounds of channel and 123,779,000 pounds of furnace black.

The total plant value of the carbon black produced in 1953 amounted to $104,868,000, against $101,988,000 in the previous year. The figures broke down to show that the average value per pound at plants of the carbon black produced in 1953 came to 6.51c, while in 1952 it was 6.36c.

In 1953, a total of 16 carbon black producers reported to the Bureau of Mines on 52 individual plants. In the previous year, 18 producers reported for 59 plants. During 1953, 1 furnace plant and 6 channel plants had been shut down.

### Tire Sale Bill Hearings

A Senate Judiciary subcommittee is now hearing testimony on a bill introduced by Senator Murray (Dem., Mont.), which would outlaw retail tire sales by company-owned stores, mail order houses or gasoline station chains. The bill is said to be a project of George J. Burger, vice-president of the National Federation of Independent Business and longtime critic of the tire companies. Originally introduced in 1942, the bill has been re-introduced periodically, only to run into some obstacle. At one time it had the unanimous backing of the Senate Small Business Committee, and hearings have also been held by the Senate Banking and Currency Committee in past Congresses. At previous hearings, Goodrich and Firestone had been represented in opposition to the bill. The bill also has been introduced in the House by Representative Patman (Dem., Texas), co-author of the Robinson-Patman Act.

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# REPORT ON RECENT SINGAPORE CONFERENCE NOTES ACHIEVEMENTS

The Singapore quality conference is now history and the delegation representing U. S. manufacturers, according to the Rubber Manufacturers Association, appears to have emerged from the conference with several definite achievements to its credit.

RMA states that a signal victory was scored in the delegation's successful resistance to rather extreme pressure for official recognition of the controversial Singapore types. Some 69 delegates representing 21 associations from 8 countries took part in the conference, and from the preliminary report on the proceedings, it appears that the U. S. group had the moral support in the type sample debate of only one nation—Indonesia. That support was passive rather than active, since the Indonesians took the position that the question of Singapore types was strictly a Singapore problem.

In successfully resisting any dilution of U. S. standards by admitting the Singapore types to the RMA family of types, the American group reiterated its earlier position with regard to promulgation of the Singapore types by the associations concerned in that area. The U. S. delegation agreed to distribute mimeographed copies of the Singapore Type Descriptions issued by the Singapore Chamber of Commerce Rubber Association to all U. S. manufacturers. Copies of the official, printed, descriptions, published by SCCRA and known as the "Blue Book" will be mailed to U. S. manufacturers as soon as they are made available.

### *Purchase of Singapore Types*

The Singapore types are traded in the world markets and can, of course, be purchased under the RMA contract by any consumer who might find he could adapt these types to his end-product requirements. Sample books covering the seven Singapore Types are now available for inspection at the RMA-RTA Type Sample Committee rooms at 15 William Street, New York, N. Y.

While the complete and official report of the Singapore conference concluded on April 24 is not yet available, W. James Sears, vice-president of RMA and chairman of the U. S. delegation, has made available a preliminary summary of the proceedings.

Mr. Sears reports that the feeling was general among all delegates that free discussion contributed substantially to a better understanding of all aspects of the quality and packing. Consumer delegates emerged from the conference with full respect of all other elements of the industry, producers, packers and shippers alike, for the position which they had taken.

Two important results of the conference were cited in the chairman's preliminary report. The first related to the RMA types. Subject to consideration by the U. S. delegation of a few recommendations, the conference approved the 23 RMA types which were not linked in any way to the discussions of the seven Singapore and similar RMA types. In this connection, it was pointed out that their principal criticism is still on the percentage rule on mould in Ribbed Smoked Sheets and what it means.

The second related to the continuing problem of the Joint RMA-RTA Type Sample Committee in obtaining suitable "book" rubber. In accordance with the recommendations of S. W. MacKenzie's subcommittee on the type sample problem, the U. S. delegation explored the possibility of getting sample rubber in the East. Mr. Sears reported that the SCCRA, the Rubber Trade Association of Singapore, the Federation of Rubber Trade Associations of the Federation of Malaya and the Indonesian Chamber of Commerce have agreed to organize to supply the RMA-RTA Type Sample Committee with such book rubber as it may need, and have offered assurance that they could and would do the job.

Best evidence that the producer-packer-shipper organizations regarded the conference as productive was their agreement to continue their explorations of quality and packing problems at a second meeting in New York. This meeting will be held in October. It is expected that most if not all of the organizations represented at the Singapore meeting will send delegates to New York.

In addition to the formal conference sessions which will provide for a continuation of the quality and packing discussions, the visitors will make side trips to rubber manufacturing centers, to docks and warehouses and to reconditioning plants to view at first hand the conditions which are the basis of most U. S. claims against the Far East.

Mr. Sears reports that in preparation for the meeting the U. S. delegation spent two days in visiting all of the operating milling plants and most of the packing houses in Singapore. He described the conditions as very bad—the real trouble being in the raw materials, and comments that "the real improvement must start there. Nearly all material for the seven Singapore types is imported from Indonesia—wet slab in poor condition and poorly smoked, dirty sheets."

Mr. Sears also reported that the U. S. delegation maintained its position that the RMA "Green Book" and the Singapore "Blue Book" should co-exist separately and not be combined. He stated that in a final plea, the spokesmen for SCCRA offered the following compromise: Rename present RMA 3 Amber as RMA 2 Amber; adopt Singapore C as new RMA 3 Amber, and allow present RMA 4 Amber to stand. The U. S. chairman stated flatly that his delegation did not have this authority, with reasons involving the democratic process, i.e., that the few members of the U. S. delegation could not speak for or commit all U. S. consumers.

In his final statement to the conference, Mr. Sears made these points on behalf of the U. S. delegation:

(1) Agreed that there was a good reason for Singapore types—poor, raw materials.

**W. James Sears**

*Chief U. S. delegate to the Singapore conference*

(2) Agreed that RMA types are not being produced in quantity now.

(3) Agreed to desirability of standards for this market rather than diverse private types.

(4) Obtained the understanding that they want Singapore types as supplementary and additional, not replacing RMA.

(5) Clarified the point that while Singapore wants its types described in the "Green Book", the RMA contends the Singapore "Blue Book" of type descriptions is sufficient.

(6) Made the point that if Singapore types were not selling but were accumulating in warehouses, the U. S. attitude might be different, but they have a buyer for every pound.

(7) Referred to the Type Sample Committee report on overlapping, pointing out that the situation would be more confusing and would lead to more misunderstanding and more claims if the Singapore types were made a part of the RMA family, and that they should stand alone.

(8) Stated that the U. S. group was prepared to: (a) distribute the Singapore Type Descriptions explaining conditions in Singapore; (b) advise manufacturers that they can purchase Singapore types on RMA contract and that Singapore type samples may be bought; (c) suggest to manufacturers that they consult their dealers as to availability of RMA and Singapore rubber and then make their own decision as to what to buy.

(9) Recommended that 30 RMA plus 7 Singapore types be universal standards. Expressed the hope that RMA will be final objective. (All agreed to this but Indonesia.)

(10) Congratulated the groups concerned for organizational work in Singapore and Malaya, particularly the Malayan Rubber Export Registration Board, and hoped other producing countries would do the same.

(11) Suggested continuation of this type of liaison and cooperation.

(12) Raised for consideration the question: What does the future hold in the way of quality improvement when technical competition is faced from private synthetic rubber?

### *Other Views on Conference*

An interesting view of the Singapore conference was taken by the *Singapore Straits Times* at the conclusion of the meeting. The following editorial was published in that paper on April 27, 1954:

"While the rubber quality and packing conference clearly fell some way short of an unequivocal success, this Singapore gathering nevertheless has been valuable. Certainly the American visitors, most of whom were paying their first visit to the East, leave with a better appreciation of the difficulties which confront shippers—even if they may still feel that not enough has been done to overcome them. There will be disappointment at the failure to secure RMA recognition of the seven Singapore type samples, but they have won a place for themselves even in the American market, and the RMA has agreed now to publicize them among its 950 member companies. Mr. C. F. Smith's claim that 'a very great deal of progress has been made' errs only a little on optimism's side.

"It depends perhaps whether American comment on the Singapore types has made its proper impact. The visitors were impressed by many things, but by nothing so much as the poor condition of much of the slab rubber which reaches the factory. The dirt content of slab rubber, said the RMA statement, is 'appalling.' It was 'a shame that such an essential and important industrial raw material is so badly prepared.' What is the industry's answer to that? Why should the quality be so very much worse than before the war?

"It is even impossible apparently to produce bales of uniform size, while packing by some firms (not estate packers) results in mis-shapen bales or the arrival of the rubber in a massed state. Why should the customer, particularly those who can turn to synthetic and be absolutely sure of getting what they ordered, put up with this kind of thing? The deadliest remark made at this conference was the reminder in the RMA statement of the real spur to increased efficiency. 'We believe,' said the statement, 'that ways will be found to improve the quality as a result of the forthcoming free competition between tree rubber and chemical rubber.' It is plain enough what will happen if the quality is not improved."

### *Technically Classified Rubber*

The Rubber Research Institute of Malaya reported to the conference very substantial progress in the program for the production of technically classified rubber. The Institute disclosed that T. C. symbols were marked on the millionth bale of that rubber early this year and reported that more than half of that rubber produced since inception of the program had been exported from Malaya.

Of particular interest to U. S. consumers who have done evaluation work on this rubber was the Institute's disclosure that it had produced and shipped the first technically classified remilled rubber late in 1953. These were in RMA No. 1 and No. 2 Thin Brown Crepes. The report said: "It has proved possible by some reorganization of milling procedure, drying and packing, to produce consignments of rubber showing remarkable technical uniformity. The position regarding expansion of output of T. C. remilled rubber is very much the same for T. C. FAQ grades by the packers."

### *T. C. Estate Rubber*

The report also said that major emphasis on T. C. estate rubber (mainly RMA No. IX and No. 1 R. S. S.) had been on increased production and improved control. The rate of production of this rubber was substantial in 1953, 10,250 tons being exported in the first half and 16,200 tons in the last half of the year.

The Institute reports that production of T. C. rubber in the Packing House R. S. S. classification (including RMA Nos. 1 through 5 but with most production in RMA No. 3 R. S. S.) had been expanded at a much slower rate. Approximately 1,400 long tons of T. C. rubber in these grades were exported in 1953. The Institute expects to see technically classified rubber in the lower grades available in considerably larger quantities through normal channels in 1954. The organization voiced the belief that some 30,000 tons of rubber could be classified in Malaya, this year.

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Market Forge Co., Everett, Mass., has made available an "Emergency Card" which provides space for the listing of important telephone numbers.

### Dow Corning Silastic S-2007

A resilient dielectric coating or encapsulating material for extreme temperature electric and electronic components has been developed by the Dow Corning Corp., Midland, Mich. Identified as "Silastic S-2007," the new silicone rubber cures in 2 to 4 hours at 200°C. to form a rubberlike jacket which is uniform, heat-stable, moisture-proof and highly resistant to oxidation, ozone and weathering, the company states. Tests indicate that transformers properly coated with this new material will easily pass both the moisture resistant and low temperature flexibility requirements of MIL-T-27 grade I. Fully cured coatings also have about twice the thermal conductivity of conventional resinous or rubber dielectrics, assuring cooler operation at high temperatures. Supplied as a solvent free, low consistency paste, Silastic S-2007 may be applied by dipping, vacuum impregnating, or may be molded in fitted encapsulating molds. Coated parts may be placed directly into a hot air oven for vulcanization. Neither pressure nor a graduated cure is necessary. Normally white, it may be tinted any shade by the user with heat-stable pigments. Fully cured coatings have a hardness in the range of 40 durometer, Shore A scale. Material cost is comparable to that of standard raw Silastic stocks.

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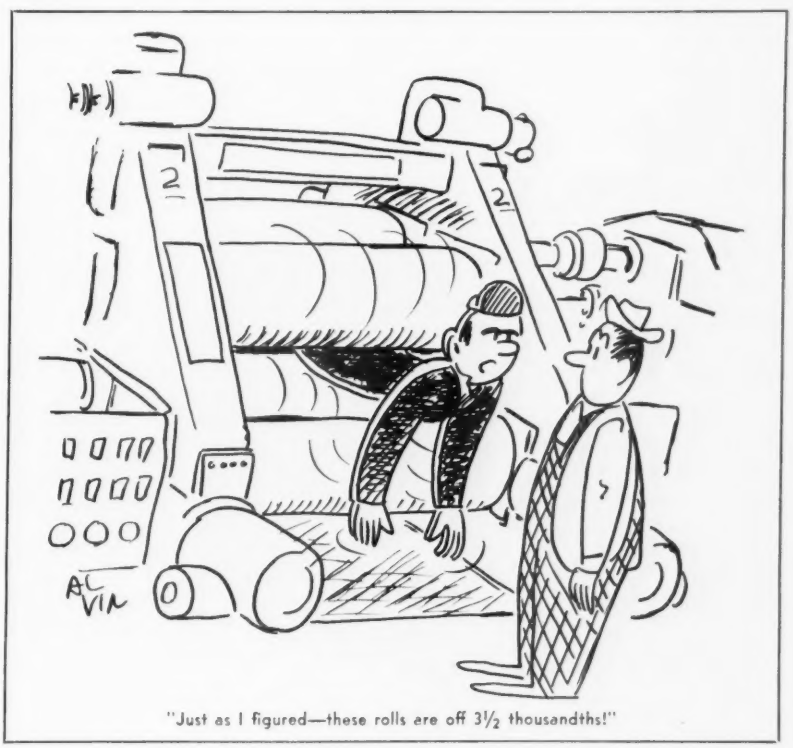
Goodyear has announced a unique, scale model rotary hose section complete with fitting as a selling aid for its field force. The model is approximately one foot in length, built to an accurate one-third scale of a three-inch rotary hose with the patented rotary hose end fitting attached, Goodyear stated.




"Just as I figured—these rolls are off 3½ thousandths!"

### Continuous Vinyl Foam Sheeting

Kyfoam, Inc., Louisville, Ky., has established what is believed to be the first commercial plant for the production of continuous vinyl foam sheeting. The Elastomer process for foaming vinyl resin-based plastisols is employed and the material is cured electronically by high frequency apparatus. Tooling up of the company's plant has been completed, and the company reports that full scale production will begin on July 1. The foam vinyl sheeting will be marketed in widths up to 54 inches, thicknesses up to 4½ inches and in any desired lengths. It will be formulated to serve the individual requirements of its users, and made available in white or any specified color. Foam vinyl, the company states, is tough, nonshrinking, and resistant to flame, soap and detergent extractions, chemicals, aging, tearing and abrasion. It does not oxidize, harden or dry out. It has the ability to "breathe," a characteristic resulting from its millions of interconnecting cells. Foam vinyl's properties, the company maintains, may be precisely controlled to produce a material that is comparable with soft foam rubber, or with hard, flexible sponge rubber. Foam vinyl is said to have many applications. It is employed in the automotive and furniture industries as cushioning and molded inserts. It is used for rollers, gaskets, toys, insulation and a long list of miscellaneous products. It can be cured directly on textiles and plastic sheeting. And it can also be heat sealed to textiles and plastic sheeting, thus making possible an infinite variety of decorative patterns.

### Plans Venezuelan Expansion

The Venezuelan associate of the General Tire & Rubber Co., Cia. Anonima Nacional Manufacturera de Caucho y Neumaticos General, better known as Cauchos General, will begin construction of a new plant in August or September, according to a recent announcement. The plant will be located four miles from the company's tire and tube plant in Chacao, outside Caracas, at a site called Boleita. It will produce rubber and plastic flooring, asphalt tile, foam rubber and polyester glass products. The plant is expected to be in operation by the first of next year. The company is also considering another plant for the processing of rayon tire cord exclusively for use in the manufacture of General tires in Venezuela.

### Witco Opens New Black Plant

Special ceremonies on May 26 marked the opening of a new furnace black plant at Ponca City, Okla., by the Witco Chemical Co. of New York, N. Y. The plant will produce 40,000,000 pounds annually of the most efficient types of furnace blacks which will be marketed solely by Witco Chemical. Production equipment includes complete instrumentation, installation of the latest types of bag filters, and permits the manufacture of high and super-abrasion furnace blacks. Principal speaker at the opening ceremonies was R. I. Wishnick, president of Continental Blacks, Inc.

### Julian Opens Washington Office

Harry W. Julian

Commander Harry W. Julian, USNR, who retired from active service on June 1, has, in association with his son, opened an office at 6700 Offutt Lane, Chevy Chase 15, Md., as a manufacturers' representative. Under the name of Harry W. Julian & Son, the new firm is in a position to represent companies having public relations, administrative or sales contacts requiring attention. The firm is already handling several such problems for two rubber companies. In his last position with the Navy, Mr. Julian served with the Office of Navy Materials as materials specialist and liaison officer for rubber, chemicals and various materials. During the war years he served as chief of the Navy Rubber Section. In civilian life, Mr. Julian has been associated with the Better Ball Co., Seiberling Rubber Co., Goodyear Tire & Rubber Co., and the B. F. Goodrich Co.

### Flexol Plasticizer 77-G

A new benzoate plasticizer with high solvent power for synthetic resins is now available in tank car quantities from the Carbide and Carbon Chemicals Co., New York, N. Y. Called "Flexol 77-G," the new plasticizer has an unusual range of compatibility with synthetic resins. It is completely compatible with polyvinyl chloride, polyvinyl acetate, polyvinyl butyral, ethyl cellulose, polystyrene, acrylates, and cellulose acetate butyrate (37% butyryl content). 77-G is also compatible with cellulose acetate butyrate (17% butyryl content) and cellulose acetate at a 4 to 1 resin-to-plasticizer ratio. Because of its high solvent power for vinyl chloride resins, 77-G promotes rapid fluxing of calendering and extrusion resins and acts as a fusion aid in organosols and plastisols. 77-G has unusual resistance to extraction by mineral oils and gasoline and is comparable to high-molecular-weight polyesters in this property. 77-G is expected to be of particular interest in vinyl flooring compounds, oil- and gasoline-resistant vinyl plastics, and polyvinyl acetate emulsion paints.

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### Two New Silicone Rubbers

More effective gasketing for aviation, automotive and electrical equipment has been made possible by two new silicone rubber compounds, now announced as available by the Silicone Products Department of the General Electric Co. "SE-370" and "SE-380" are new additions to G-E's Class 300 silicone rubber compounds. The Class 300 stocks are claimed by G-E to exhibit the lowest compression set of all known elastomers, over a wide temperature range up to 500° F. Similar to the company's well-known SE-360, the new compounds, SE-370 and 380, differ from it chiefly in terms of their durometer. G-E engineers said they thereby provide designers with stiffer stocks more suitable for sealing and gasketing applications involving high pressures. The new silicone compounds are also characterized by low shrinkage and low moisture absorption. The Class 300 compounds shrink 50% less than most other silicone rubber stocks, and absorb less than 1% moisture after continued immersion in boiling water. Because of their low shrinkage, the new compounds may often be used in molds designed for organic rubber. Applications for SE-370 and SE-380 include capacitor and transformer bushings; O-rings, gaskets and seals for both jet and piston aircraft engines; and gaskets for railroad, tractor and automobile engines.

### Establishes Scholarship Program

American Cyanamid Co., New York, N. Y., has established an undergraduate scholarship program in chemistry and chemical engineering to supplement its existing post graduate fellowships and grants. Under the new program 17 undergraduates about to enter their junior or senior year will be awarded $600 each for the academic year 1954-55. In addition, each scholarship college will receive $300 for the unrestricted use of its chemistry or chemical engineering department. Under the fellowship program, 15 graduate students in their final pre-doctoral year of study receive $1,500 plus full tuition and laboratory fees. Their department of chemistry or chemical engineering receives $300 for unrestricted use. Students receiving fellowships or scholarships under the two Cyanamid programs are selected by the appropriate university and college authorities.

### Three New Vibrin Plastics

Naugatuck Chemical Division, U. S. Rubber Co., has announced three new plastics particularly developed for the construction of reinforced plastic car bodies. The new materials are "Vibrin VPA," a water soluble material that prevents the body from sticking to the mold; "Vibrin Shellcoating," a polyester surface coating that covers up the glass reinforcing fibers and gives a slick finish that takes paint smoothly, and "Vibrin 151", a polyester body material with sufficient flexibility to take road shock without cracking. Now in production, the new plastics are being used in the Chevrolet Corvettes, the Kaiser-Darrin and several other plastic car bodies.

## Noble Elected Vice-President

Dr. Royce J. Noble

Rubatex Products, Inc., New York, N. Y., has announced the election of Royce J. Noble, consulting engineer of Melrose, Mass., as vice-president. Dr. Noble, who will also serve as a director of the company, will be in charge of its research and development program, consulting on technical matters with the company's 25 licensees in the United States, as well as its 22 Canadian licensees. Dr. Noble has been associated with the rubber and latex industry for many years and has been a consultant in this field since 1931. In World War II, he held the rank of Colonel in the Chemical Corps, U. S. Army, and served as Chief of the Engineering Division, Edgewood Arsenal. At the same time he was adviser to the Bureau of Ships, U. S. Navy, in the manufacture of microporous synthetic rubber products. Dr. Noble is a member of the American Chemical Society and the American Institute of Chemical Engineers, and is a Fellow of the Institution of the Rubber Industry of Great Britain. He is the author of numerous publications and patents, and of "Latex in Industry," published in its second edition in 1953.

## Witco Opens English Factory

Witco Chemical Co., Ltd., of London, England, in line with the policy of the parent company in the United States, has entered the manufacturing field through the acquisition of a factory and technical research laboratory at Droitwich, Worcestershire, England. The factory comprises a modern industrial plant in Union Lane. At the outset, the plant is manufacturing synthetic latex compounds for use in the production of latex base-paints. Ultimately, the plant will produce the same chemicals as manufactured by the parent firm in the U. S. The new English plant, plus the full-scale research laboratory and technical staff, will enable Witco to produce to the individual specifications of customers in England and on the continent.

## Objects to Shallow Matrices

The Rubber Manufacturers Association, Inc., New York, N. Y., in a recent announcement, stated that the promotion among retreaders of the use of shallow skid-depth matrices gravely concerns the members of its Tire Accessories and Repair Materials Committee. This operation would permit the use of 7/32-inch gauge camelback where ordinarily 12/32-inch and 14/32-inch material would be utilized. In the committee's opinion such a practice is detrimental to public safety because the resulting tread thickness affords insufficient carcass protection against bruise breaks, cuts or punctures. The committee believes that a tire retreaded with less than 10/32-inch camelback will deliver correspondingly less service. For instance, a 6/32-inch tread depth will give some 45% less mileage than a regular first-quality retreaded passenger car tire. This difference in tread thickness is not readily discernible to the purchaser and he would have no knowledge that he is acquiring a sub-standard product, RMA states.

RMA points out that the cost per mile of such a retread would be higher than that of a standard depth first-quality retread. Furthermore, the low economic value of the shallow type retread would compel vulcanizers to purchase second-grade repairable cord bodies. From the safety standpoint alone this is quite undesirable, RMA claims. As there is no saving on labor or overhead costs in producing the shallow depth retread, the only potential economy is in the slight difference of material content between the shallow and the standard gauges. RMA believes that reputable retreaders who are mindful of the future will shun the use of shallow skid-depth matrices, secure in the knowledge derived from experience that the best method of competing with new tires is to assure the customer long-wearing and safe retreads.

## Rubber Division Fall Meeting

Preliminary details have been made available on the Fall Meeting of the Division of Rubber Chemistry, American Chemical Society, which will be held from September 15 through 17 at the Hotel Commodore in New York City. The local Chairman in charge is Joseph F. Breckley (Titanium Pigment). The first technical session will start at 2:00 P. M. on Wednesday, September 15 with J. C. Walton (Boston Woven Hose), division chairman, presiding. This session will be preceded by a regular meeting of the 25-year Club. The division secretary, A. M. Neal (DuPont), advises that the deadline for receipt of abstracts of papers to be presented at the meeting has been established as June 29. Abstracts should be of about 200 words, submitted to the secretary in triplicate. In an accompanying letter of transmittal, the secretary must be told the laboratory in which the work was done, who will deliver the paper, and how much time is required. One of the authors of the paper must be a member of ACS and four copies of the paper are to be handed to the secretary at the meeting. Mr. Neal may be addressed at E. I. du Pont de Nemours & Co., Inc., P. O. Box 406, Wilmington, Del.

## Sheridan Promotion Announced

James P. Sheridan

New Jersey Zinc Sales Co. has announced the appointment of James P. Sheridan as manager of pigment sales for the western district, with headquarters in Chicago, Ill. Mr. Sheridan has been in the service of the company for more than 31 years, and for the past 18 years he has been a sales representative in the pigment field. In 1945 he served as chairman of the Chicago Rubber Group, an organization sponsored by the Rubber Division of the American Chemical Society, and is still very much interested in its activities. He is currently a member of the Executive Committee of the Chicago Paint, Varnish and Lacquer Association.

## Pennsylvania Coal Changes Name

Pennsylvania Coal & Coke Corp. of New York, N. Y., has announced a change in company name to the Penn-Texas Corp. For more than forty years the company had only one source of income, the mining and sale of bituminous coal. When new management took over in 1951, the corporation embarked upon a program of expansion into other basic industries. In the intervening years the concern acquired several other firms, among them the Crescent Co., Inc., of Pawtucket, R. I. As these new properties have been taken over, coal has become a lesser factor in the corporation's total business. It was for this reason that the change in company name was adopted. The new name gives some indication of the territorial scope of the corporation's activities, without implying any restriction in the scope of its business.

## Fire Strikes Garfield Rubber

Fire of undetermined origin swept through the plant of Garfield Rubber Products, Inc., of Garfield Heights, Ohio, early in May, causing an estimated damage of $15,000. Fire Department officials stated that firemen were hampered more than an hour by dense smoke from rubber supplies stored in the one story brick building. Louis J. Zsoka, president and general manager of the concern, estimated the damage at $1,000 to the building and $14,000 to equipment and rubber supplies.

### Government Alcohol Plant Sold

The General Services Administration announced on May 20 that it has completed the sale of an alcohol plant located at Muscatine, Iowa, to the Grain Processing Corp. of that city. Edmund F. Mansure, Administrator of General Services, said the negotiated sale involves payment by the corporation, over a 13-year period, of $655,000 for 36 acres of land, buildings, machinery and equipment. The facility was built in 1943 by the Defense Plants Corp. at an acquisition cost of $4,028,349. "Since that time," Mr. Mansure said, "the government has collected $3,571,000 in net rentals, which, when added to the purchase price means the government will have more than recovered the cost of the facility."

The plant during the war processed 13,000 bushels of grain daily to produce 9,000,000 gallons of 190 proof industrial alcohol a year. In 1945, feed recovery facilities were added, having a capacity of 30,000 tons annually. The Grain Processing Corp., an organization of local businessmen, has operated the plant under lease since it was built. The corporation has agreed to spend $120,000 on plant improvements in the next 18 months. After the war the plant was transferred from the RFC to the Department of Agriculture. When the grain alcohol market declined, the operator limited production to Vitamin B-12, Riboflavin and animal feed by-products. In March of 1950 the plant was declared surplus to the government but leasing continued until the sale announced on May 20.

### Omya BSH Calcium Carbonate

The Pluess-Staufer organization, which was founded in 1884 and which makes its headquarters in Switzerland, is one of the internationally recognized firms in the chemical field. The latest product introduced by this organization is Omya BSH, a natural, surface-treated calcium carbonate, said to be made from the very soft and pure whiting found in the Champagne district of France. The crystalline character of this chalk, reported to have an extraordinarily fine structure, is said to be due to the particular formation of the deposits from which it is taken at Omey-on-the-Marne. According to the company, the formation of these deposits took place about a hundred million years ago. Omya BSH is not a reinforcing filler, but is said to facilitate the incorporation of such pigments in rubber compounds. Made by a patented process, each individual particle comes in direct contact with the coating agent in which it is incorporated, thus providing for good dispersion and easy processing. The product is also reported to give a plasticizing effect. Omya BSH may be secured from Pluess-Staufer (North American) Inc., at 82 Beaver St., New York 5, N. Y.

Blast cleaning by airless means in a tumble-type machine is the subject of a new bulletin published by the American Wheelabrator & Equipment Corp. Ask for Bulletin No. 114-B.

## FINANCIAL NEWS

### Lee Rubber & Tire Corp.

Six Months to April 30: Net income of $633,710, which is equal to $2.28 a share, compared with $815,808, or $2.93 a share, for the same period of 1953. Net sales for the six months ending April 30 amounted to $17,428,466, compared with $20,991,667 in the preceding year.

### Circle Wire & Cable Corp.

Quarter Ended March 31: Net income of $374,187, which is equal to 50c a share, compared with $667,567, or 89c a share, in the same quarter of the preceding year. Sales for the first quarter of 1954 amounted to $4,898,865, compared with $7,367,770 in the first quarter of 1953.

### United Carbon Co.

Quarter Ended March 31: Net income of $1,029,681, which is equal to $1.29 a share, compared with $1,005,908, or $1.26 a share, in the quarter ended March 31, 1953. Sales for the first quarter of this year amounted to $8,650,094, contrasted with $9,168,953 in the first quarter of 1953.

### Boston Woven Hose & Rubber Co.

Six Months to February 28: Net loss of $278,376, compared with a net income of $117,342, which is equal to 28c a common share, in the corresponding period of the preceding year.

### Anaconda Wire & Cable Co.

Quarter Ended March 31: Net income of $1,256,853, which is equal to $1.49 a share, compared with $1,921,922, or $2.28 a share, in the quarter ended March 31, 1953.

### Thermoid Company

Quarter Ended March 31: Net income of $180,900, which is equal to 19c a common share, compared with $350,451, or 40c a share, in the quarter ended March 31, 1953.

### Belden Mfg. Co.

Quarter Ended March 31: Net income of $343,132, which is equal to $1.07 a share, compared with $313,922, or 98c a share, in the quarter ended March 31, 1953.

### Revised Carbon Black Chart

United Carbon Co., Inc., Charleston, West Virginia, has issued a revised version of its chart which provides, at a glance, a summary of all rubber grade carbon blacks produced. The various types of black are identified as are the producers.

**Can't locate the office copy of RUBBER AGE when you need it? Use the coupon on page 457.**

### ASTM Dedicates Warwick Memorial

The Warwick Memorial Room in the headquarters of the American Society for Testing Materials, Philadelphia, Penna., was dedicated during a meeting of the board of directors on May 10. The dedication consisted of the unveiling of an oil painting of C. Laurence Warwick and the mounting of two bronze plaques—the central tablet inscribed "This room is dedicated to the memory of C. Laurence Warwick who served the Society with distinction 1909-1952" and citing positions in which he served the Society. Mr. Warwick, long-time executive secretary of ASTM, passed away suddenly on April 23, 1952. As administrative head of the Society since 1919, he had made many notable contributions in the field of standardization and research in materials and was recognized as an outstanding leader in the standardization movement in this country. While he was instructor and assistant professor at the University of Pennsylvania, he also served as assistant secretary of ASTM with Edgar Marburg, the Society's founder secretary. In 1919, on the death of Dr. Marburg, he was appointed secretary-treasurer (chief executive officer) and in 1946 became executive secretary.

### 3M Stock Purchase Plan

Stockholders of the Minnesota Mining & Mfg. Co., St. Paul, Minn., have approved plans to grant stock purchase options to employees and executives of the parent company and its wholly-owned subsidiaries. The action was taken at the annual meeting of the stockholders in the firm's home offices. The plans authorize the management to grant three-year options on 200,000 shares of common stock to non-executive employees and to grant options on 150,000 shares to officers and top executives over a five-year period. Option price under the non-executive plan will be $64.50, which is 95% of the fair price on the current market. The price under the executive plan will be 100% of the fair market price on the day those options are granted. The plans give 3M's management authority to provide shares purchased under the options either by issuing new shares or by purchasing shares on the market and reselling them to eligible option holders. Authorization has been granted to issue 10,000,000 shares of common stock. Currently there are 8,218,985 shares outstanding.

### Pickard Opens Consulting Office

James K. Pickard has opened a consulting practice in atomic energy developments at 1518 K Street N.W., Washington 5, D. C. Mr. Pickard resigned from the U. S. Atomic Energy Commission in May and set up his office in Washington as successor to Frederick H. Warren who recently became connected with General Dynamics Corp. The field in which Mr. Pickard offers his services includes the impact of atomic energy developments in different types of business, and opportunities for business created by atomic energy, with emphasis on nuclear power.

### Super-Strength Conveyor Belt

A new super-strength conveyor belt which makes it possible to haul thousands of tons of coal per hour on one continuous belt a distance of three miles underground —a mile longer than any underground belt conveyor in existence—has been developed by the U. S. Rubber Co., New York, N. Y. The new belt, called "Super Ustex-Nylon," utilizes a new type of cellulosic yarn which is treated chemically to give it exceptional strength. It is three times stronger than the strongest rayon belt fabric and three and one-half times stronger than the strongest cotton duck used in belts today. The only belt carcass material in its strength range is steel cord. Its big advantage over steel cord, however, is that it cannot rust or corrode. The cellulosic yarn is used as the longitudinal or strength carrying part of the belt fabric. Nylon, because of its shock absorbing ability and greater flexibility, is used as the crosswise fiber in the fabric. The combination gives the belt tremendous strength and, at the same time, the ability to absorb loading shocks. The greater flexibility makes the belt train better on the idlers or rollers which cradle the belt as it moves along on its journey.

In main haulage underground coal conveyor systems, one of the new belts 42 inches wide could carry coal at a continuous rate of 1,000 tons per hour at a speed of 600 feet per minute for a distance of three miles without transfer. This offers two big advantages to the operator: (1) It maintains the quality and size of the lumps of coal. Transferring coal from belt to belt breaks the lumps, causing an excessive amount of fines; (2) It reduces the wear on the belt as coal loads at one given point on the belt only once every 53 minutes at normal operating speed. On a 42-inch wide slope conveyor hauling 1,000 tons of coal per hour from the bottom of the mine to the surface of the ground, the belt will permit vertical lifts in excess of 800 feet. It would be entirely possible to construct a slope belt conveyor utilizing a 72-inch Super Ustex-Nylon belt requiring a 2,500 horsepower drive.

### Flexol Plasticizer TOF

Increased quantities of "Flexol Plasticizer TOF" (tri-[2-ethylhexyl] phosphate) are now available from a recently completed production unit at the South Charleston, West Virginia, plant of the Carbide and Carbon Chemicals Co., a division of Union Carbide and Carbon Corp. Because of its outstanding properties, TOF has been used as a plasticizer in many vinyl and rubber products for national defense. Now that availability has been increased, it is possible to make many products for everyday use based on the same unique characteristics. Among the properties imparted to vinyls by TOF are: resistance to embrittlement even at temperatures below —70° C., flame resistance, fungus resistance, and resistance to water extraction. TOF is also more resistant to "rub-off" from upholstery sheeting than other low-temperature plasticizers and is a superior dispersant for plastisol resins.

### Ansonia Appoints Biskeborn

Hugo W. Biskeborn

Ansonia Wire & Cable Co., Ansonia, Conn., has announced the appointment of Hugo W. Biskeborn to the engineering and production staff of the company. Alden P. Lunt, president of Ansonia, said that Mr. Biskeborn will initially assume the duties of methods and planning engineer and will headquarter at the company's main office at 63 Main St., Ansonia, Conn. Mr. Biskeborn comes to the company with many years of engineering and research background in non-ferrous metals and insulated wire and cable.

### Constructing Silicates Plant

Johns-Manville Corp., New York, N. Y., has begun building a new plant at Lompoc, Calif., for the manufacture of synthetic silicates from diatomite. The plant will produce an entirely new line of company products from the synthetic silicates, tailor-made for use as inert absorbents, bulking agents or extenders in rubber, paint, cleansers, insecticides, etc. The new plant will be in operation in eighteen months to two years, according to the company, and it is located adjacent to present Johns-Manville operations at Lompoc where the company owns and operates the world's largest and purest known deposit of diatomite, estimated to be 15,000,000 years old. The synthetic silicates will be manufactured directly from crude diatomite by reaction with lime or magnesia under pressure.

### Buys Gavitt Wire & Cable

American Hard Rubber Co., New York, N. Y., has purchased the Gavitt Wire & Cable Co., Brookfield, Mass., for an undisclosed amount in cash. Gavitt, a 30-year-old concern with two plants near Brookfield, employs about 200 and specializes in making miniature wire and cable for the electronics industry. Since American Hard Rubber up to now has confined itself mostly to making plastic and hard rubber products, the purchase will result in diversification, a spokesman for the New York company said. He added that Gavitt's business dovetails well into American Hard Rubber's operations, because the wire and cable products are coated with rubber and plastic.

### Passenger Conveyor in Operation

What is said to be the world's first passenger belt conveyor was placed in operation on May 24 by the Hudson & Manhattan Railroad in Jersey City, N. J. Designed by the Goodyear Tire and Rubber Co. and the Stephens-Adamson Manufacturing Co., the "Speedwalk" has been installed in the H&M's Erie tube station to transport homeward bound New Jersey commuters for a distance of 227 feet up an inclined ramp leading to the Erie Railroad terminal. The moving rubber belt passenger conveyor negotiates a 10% grade for the first 137 feet. Operating at a speed of 120 feet per minute, the belt will deliver passengers who walk along its moving surface to the end of the ramp in 35 seconds, compared with a normal up-grade walking time of 55 seconds through the regular passageway.

Five and one-half feet wide and with moving handrails, the belt conveyor utilizes only approximately half of the regular H&M ramp tunnel, leaving a walkway alongside. A 20-horsepower electric motor drives the endless belt which rides along a bed of closely spaced steel rollers or idlers. Hudson and Manhattan work crews spent a month installing the 30 tons of conveyor equipment and machinery, which was fabricated at the Stephens-Adamson plant in Aurora, Ill., and the 11,000-pound rubber and fabric belt made by Goodyear in Akron, Ohio. The belt is five-eighths of an inch thick and was manufactured as a single unit 460 feet long. Goodyear engineers vulcanized the two ends together after the belt was threaded through the end pulleys and placed on the conveyor frame work. The Speedwalk can handle 10,800 passengers an hour in a single direction at a speed of one and one-half miles an hour. Only about 9,000 commuters now use the Erie tube station daily.

### New Royal Bicycle Tire

A new bicycle tire that fits all standard balloon rims, but with a smaller cross-section to give the speed and pedaling ease of light-weight tires, has been announced by the U. S. Rubber Co., New York, N. Y. Called the "U. S. Royal Middleweight," this new tire has a cross section of only 1.75 inches, and is made for 20-, 24- and 26-inch wheels. The size is just mid-way between the 2.125-inch balloon and the 1.375-inch lightweight tire. The Middleweight is designed as a replacement for current balloon tires, and it will be standard equipment on many newer types of American bicycles soon to appear. A new tread design in the Middleweight consists of three smooth ribs for easy running, plus two ribs with road-gripping blocks for traction and braking power. The combination gives speed and easy pedaling to all bicycles with balloon rims with virtually no change in the cushioning comfort of balloon models. High quality cotton fabric is used, and the special tread is made of natural rubber to give as little rolling resistance as possible. The tire will be available with white sidewalls or in conventional black. Matching tubes, made of Butyl, that hold air ten times as long as ordinary rubber tubes, will also be offered.

# NAMES IN THE NEWS

B. B. Countryman, director of purchases for the Minnesota Mining & Manufacturing Co. since 1942, has been elected a vice-president in charge of the Purchasing Division. I. R. Hansen, associated with the firm since 1943, has been elected assistant treasurer.

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Albert R. Robbins, associated with Stein, Hall & Co., Inc., since 1951, has been named manager of the adhesive, latex, paper, textile, food and pharmaceutical laboratories of the company in Long Island City, N. Y.

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Dr. R. P. Dinsmore, vice-president in charge of research and development of the Goodyear Tire & Rubber Co., has been elected a term member of the M.I.T. Corporation, governing body of the Massachusetts Institute of Technology.

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William M. Widenor, formerly associated with the New Jersey Zinc Sales Co., has joined the Polychemicals Division of the West Virginia Pulp and Paper Co., Charleston, S. C., to do development work on the use of Indulin in rubber.

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E. G. Steinmark, associated with the Pennsylvania Industrial Chemical Corp. for the past six years, has been named Philadelphia district sales manager.

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James W. Hendry has been promoted to vice-president of the Jackson & Church Co. of Saginaw, Mich. He is a well-known designer of plastics molding presses.

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Gerrit Oldenbrook, for the past five years plant manager of the Watertown, Mass., plant of the Coated Fabrics Division, H. M. Sawyer & Son Co., has been named head of the division.

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G. O. Lienhard, president of the Chicopee Manufacturing Co., has been named chairman, president and general manager of the Permacel Tape Corp. Both companies are subsidiaries of Johnson & Johnson.

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Harry T. Fogg, formerly associated with the Alfred Hale Rubber Co., has been appointed New England representative of the Bearfoot Sole Co.

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Howard Lee Young, associated with the American Zinc Sales Co. since 1937, has ben elected a vice-president in both American Zinc Sales and the American Zinc Oxide Co.

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George M. Riveire, in charge of the Washington, D. C., office of the Goodyear Tire & Rubber Co., has been elected president of the Washington Post of the American Ordnance Association, while W. James Sears, vice-president of the Rubber Manufacturers Association, was elected secretary-treasurer.

Edward R. Newcomb, associated with the Minnesota Mining and Manufacturing Co. since 1950, has been elected vice-president of export sales of the company's International Division.

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Royce P. Buck, formerly a field representative in the Development Department of the Wyandotte Chemicals Corp., has been named field representative in the company's Michigan Alkali Division in the Eastern District Office.

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W. C. Enright, formerly associated with the Chrysler Corp., has been appointed sales manager of the Automotive Rubber Co., Inc.

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John Sutton, previously plant engineer at the Cadillac, Mich., plant of the B. F. Goodrich Co. Industrial Products Division, has been named plant engineer of the division's Plant 4 in Akron, Ohio.

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Major General Robert P. Hollis, Commanding General of the New York Quartermaster Purchasing Agency, has been appointed Commanding General of the Philadelphia Quartermaster Depot as an additional duty.

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James A. Pollock, associated with the General Tire & Rubber Co. since 1943, has been named factory manager of the new Ashtabula, Ohio, chemical plant of the company's Chemical Division.

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C. J. Schmidt, formerly in charge of the Detroit, Mich., office of the J. O. Ross Engineering Corp., has been named vice-president in charge of sales and will make his office at the company's headquarters in New York.

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John S. Collbran, Jr., associated with the New Jersey Zinc Sales Co. since 1945, has been named western district sales manager succeeding David P. Brannin, who has retired.

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Harvey S. Firestone, Jr., chairman of the board of the Firestone Tire & Rubber Co., has accepted the national chairmanship of the United Community Campaigns of America.

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Samuel Broers, president of Firestone International and Interamerica Companies, was recently honored by the Firestone Tire & Rubber Co. for 40 years' service and presented with a diamond-studded pin.

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William A. Karl, president of Firestone Textiles, a division of the Firestone Tire & Rubber Co., recently received an honorary master of science degree from the New Bedford Institute of Textiles and Technology, New Bedford, Mass.

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Leonard E. Dupras, associated with the American Cyanamid Co. since 1953, has been appointed a New England sales representative of the Pigments Division.

**Vodra Joins Wooster Rubber**

Victor H. Vodra

Victor H. Vodra, formerly manager of calcium carbonate sales for the Wyandotte Chemicals Corp., Wyandotte, Mich., has joined the Wooster Rubber Co. of Wooster, Ohio, as technical director, a newly-created post. In his new position, Mr. Vodra will coordinate activities of design, chemistry and quality control divisions in the Wooster plant. Prior to his association with Wyandotte Chemical, Mr. Vodra operated his own business, the Northwest Research & Development Co. During his career, he has also been general manager of the Griffith Rubber Mills, and Pacific Coast representative of the R. T. Vanderbilt Co. He has contributed to the rubber literature and has authored booklets now in use as reference standards in the chemical field for calcium carbonates. His interest in rubber chemistry led him to organize courses in rubber compounding now in their third year at Wayne University, Detroit, Mich. During the war years, Mr. Vodra also taught courses on the use of synthetic rubbers at the University of Southern California. A graduate of the University of Southern California, Mr. Vodra is active in the affairs of the American Chemical Society, its Division of Rubber Chemistry, and several local rubber groups.

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J. A. Field, assistant manager of the Fine Chemicals Department of the Carbide and Carbon Chemicals Co., has been named a consultant to the Chemical Division of the Business and Defense Services Administration, U. S. Department of Commerce, for a six-month period beginning June 1.

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William Engs, formerly manager of manufacturing of the Agricultural Chemicals Division of the American Cyanamid Co., has been appointed assistant to the president of the Stauffer Chemical Co.

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James P. Falvey, formerly executive vice-president of the Electric Auto-Lite Co., has been elected president succeeding the late Royce G. Martin.

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## CANADIAN NEWS

One $20 tire on a new model car is equal to $300 worth of tires from an old model T, according to R. C. Berkinshaw, president and general manager of the Goodyear Tire and Rubber Co. of Canada, Ltd. Mr. Berkinshaw used this illustration in commending Canada's rubber industry for 100 years of good work. Mr. Berkinshaw was speaking to the Rubber Association of Canada, which had just re-elected him president.

"The old style tire cost the consumer $10 per 1,000 miles—at the same rate the new $20 tires, lasting 30,000 miles, would cost about $300," he said. But comparisons in tire costs were only a small part of the industry's development and future, which the Goodyear executive said could be used as a scale to judge the country's standard of living.

"There are 70 rubber plants in Canada employing 22,000 people plus the jobbers and wholesalers. In all, there are 200,000 persons depending on the industry for their livelihood. Each year in Canada we use more than $100,000,000 worth of raw materials and have a wage bill of $65,500,000, and we produce nearly $300,000,000 in goods." Mr. Berkinshaw promised even greater things for the rubber industry and the people who go to make it up.

He termed "practical dreams" such ideas as new synthetic tires which will outlast the cars; sidewalks that move in the downtown areas, carrying the pedestrians on rubber belts; highways made to withstand all punishment with a new paving material containing rubber, and plastics replacing hundreds of thousands of tons of steel in automobile bodies.

"Some of these dreams may seem fantastic, but so would talk of pneumatic tires carrying loads measured in tons have seemed fantastic to the men who in 1854 founded the rubber industry in Canada," he concluded.

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Production of Saran monofilament has begun at Richmond Plastics, Ltd., the Canadian division of the National Plastic Products Co. Located 74 miles east of Montreal in the Province of Quebec, Richmond Plastics, Ltd., is producing Saran monofilaments for the Canadian textile trade. The National Plastic Products Co. is said to be the world's largest producer of Saran monofilaments.

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William M. MacLean has been appointed general sales manager for the Latex and Reclaim Division of the Dominion Rubber Co., Montreal, Canada. Mr. MacLean, who was market research engineer for the Chemical, Latex and Reclaim Division prior to his new appointment, joined Dominion Rubber in 1935. From 1942 to 1945 he served as liaison officer at Washington, D. C., to the United States, United Kingdom and Canadian governments on the Synthetic Rubber Program. He was also loaned to the Canadian Defense Production Department from 1951 to 1952 as assistant chemical controller. Mr. MacLean received his formal education at the University of Western Ontario and Acadia University.

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Alan L. Francis of the Goodyear Tire & Rubber Co. of Canada, Ltd., has been appointed president of the Council of Canadian Purchasing Associations. He is also vice-president of the National Association of Purchasing Agents, which embraces both the Canadian and American purchasing fields. Mr. Francis has been associated with the Goodyear organization for 36 years in both sales and purchasing capacities.

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The United Kingdom treasury has boosted "very substantially" the number of dollars available for imports of Canadian synthetic rubber. As a result, Canada's big synthetic rubber producer—the Crown-owned Polymer Corp., at Sarnia, Ont.—expects to do some $5,000,000 of business this year in this market. United Kingdom imports will be in the form of Butyl for use in tire tubes, oil resistant rubbers for several industrial applications, and certain special rubbers for use in shoe soling. With United Kingdom's industry's heavy investment in natural rubber plantations, the government is still rigidly opposing large-scale use of GR-S in auto tires by refusing to sanction dollars for its import. Growth in Polymer's export markets this year has more than counteracted a 10% reduction in domestic business so that overall operations are currently at a new peak. Market break-down is running 60% export to 40% domestic.

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The B. F. Goodrich Rubber Co. of Canada, Ltd., has purchased some land in Thorold township near Welland, Ont., for future industrial expansion, Ira G. Needles, president, said recently. The company had no comment on a Niagara Falls story that a factory employing 1,000 to 1,500 persons may be erected. A Welland source says 60 acres have already been purchased with an option taken on "at least as much, if not more," than that amount.

"The acquisition of this land merely represents our company's faith in Canada's future prosperity," Mr. Needles said in a prepared statement. "We want to make clear that this purchase does not indicate any plans for the erection of a large manufacturing plant in the area." He said current rumors about the size of the factory and the labor force that may be employed are simply rumors "without any basis in truth."

"Our interest in the subject is nominal and simply indicates our desire to have land available if at some future date it would be advisable to produce raw materials for our manufacturing purposes in Canada," Mr. Needles said.

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P. G. Cockburn has been appointed Toronto District Manager of the Tire Division, B. F. Goodrich Rubber Co. of Canada, Ltd. "Mr. Cockburn's 20 years of experience in the tire industry signally qualifies him for his new responsibilites in charge of our company's expanding operations in the Toronto district," stated W. E. Ireland, vice-president of the company.

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### Chemical Trail Blazers Exhibit

Any chemist with a new idea, a new material, a new device or a new observation has been invited to submit it to the Chemical Trail Blazers' Exhibit which is part of the 8th National Chemical Exposition to be held at the Coliseum in Chicago, Ill., October 12 to 15. Space has been made available for any kind of chemical novelty and all a contributor need do is send his request for space to Dr. Paul E. Fanta, Trail Blazer chairman, at the Illinois Institute of Technology, Chicago 16, Ill.

## LOS ANGELES NEWS

The new plant of the Midwest Rubber Reclaiming Co. in Los Angeles has now been completed. The plant, which began initial manufacturing operations in February, was built at a cost of $2,500,000. William Welch, chairman of the board of directors of the company, predicted that the rubber industry on the Pacific Coast will grow at a faster pace than in any section of the United States.

"It is my opinion," said Mr. Welch, "that the present 50,000 pound daily capacity of our new plant will be insufficient to meet the demand for finished products. The growth of the whole rubber manufacturing industry west of the Rocky Mountains will require substantial expansion of our operations in a very few years," Mr. Welch declared.

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Production of U. S. Koylon foam products began on May 26 at the new foam rubber plant of the U. S. Rubber Co. at Calif. Located on a 54-acre tract of land, owned by the company, the plant is of modern one-story construction containing 87,000 square feet of floor space. It is equipped with modern manufacturing facilities and at the present time employs 150 persons. The plant is operated by the Footwear and General Products Division of the company.

This is the third foam rubber manufacturing unit placed in operation by the company, and its sixth major expansion in the same field since World War II. Other installations are in Mishawaka, Ind., and Woonsocket, R. I. Opening day ceremonies at the plant were attended by H. E. Humphreys, Jr., president, and several other top executives of the firm.

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The NRM Mil-X-Truder accepts previously compounded rubber stock at room temperature, mixes it intensively as it is brought to extrusion temperature, and then extrudes the section—all in one operation.

Apart from the cost-saving advantages of combining two operations, the Mil-X-Truder facilitates mechanical rubber goods production in other ways . . . Normally the same dies used on standard Extruders can be used on the Mil-X-Truder with equal effectiveness, and materials difficult to run on standard machines will often run with ease on the Mil-X-Truder.

**FOUR IMPORTANT QUALITY FEATURES MAKE THE NRM MIL-X-TRUDER MOST PRODUCTIVE . . . PROFITABLE**

1. **COMPACT** — *Creatively engineered for greatest workability, yet requires little floor space.*
2. **RUGGED** — *Sturdily built to "stand the gaff" of mechanical rubber goods production in the busiest plants.*
3. **VERSATILE** — *Permits extruding a wide variety of sections direct from the cold stock.*
4. **DURABLE** — *Precise, corrosion-resistant construction assures long, productive life with minimum maintenance.*

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2290

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# OBITUARIES

### *Dr. Charles M. A. Stine*

Dr. Charles M. A. Stine, vice-president and director of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., died on May 28. He was 71 years old. The first DuPont official connected with the atomic energy project during World War II, Dr. Stine also instituted the research program for DuPont which led to the development of nylon. Dr. Stine devoted his early researches to the development of processes for the manufacture of high explosives not previously produced commercially in this country. He was also active in the formation of the American dye industry. Born in Norwich, Conn., Dr. Stine received the A.B., B.S., A.M., M.S., and Sc.D. degrees from Gettysburg College in Pennsylvania. In 1907 he received the Ph. D. from Johns Hopkins University. Joining DuPont in 1907 as a member of the Eastern Laboratory staff, during the next 20 years he rose to be chief technical advisor of the company. Dr. Stine retired as a member of the executive committee and advisor on research and development in 1945, but continued as a vice-president and director of the company. He relinquished the vice-presidency shortly before his death. Dr. Stine is survived by his wife and two daughters.

### *Henry G. Weilert*

Henry G. Weilert, vice-president and general manager of the Firestone Tire & Rubber Co. plant in Venezuela, died of a heart attack on April 29 in Caracas. Mr. Weilert, who was 56 years old, had spent 26 years with the company in South America. Born in Brooklyn, he was graduated from Brooklyn High School and attended Columbia University. He joined the Firestone export organization in 1926, and shortly thereafter was stationed in Colombia, Peru and Ecuador as a Latin American field representative for the company. In 1939, Mr. Weilert became sales manager for Firestone de la Argentina, S. A., in Buenos Aires. Appointed field manager for the Firestone Interamerica Co. in Venezuela, he held that position until his recent appointment as managing director of Firestone's new plant in Venezuela. Mr. Weilert is survived by his wife and daughter.

### *Merton W. Rounds*

Merton W. Rounds, for twenty-five years superintendent of the Okonite Co. plant in Passaic, N. J., died on May 22 of a heart attack. He was 55 years old. The Okonite Co. manufactures friction and rubber tape and insulated wire and cable. Mr. Rounds is survived by his wife and two daughters.

### *Harry Anderson Astlett*

Harry Anderson Astlett, senior partner in the rubber importing concern, H. A. Astlett & Co., New York, N. Y., until his retirement in 1942, died on May 11 in Montclair, N. J. He was 86 years old. Born in Devonshire, England, Mr. Astlett went to Brazil at the age of 20 as a representative of Singlehurst, Brocklehurst & Co., of Liverpool, importers of natural rubber and other materials. In 1895 he came to New York to join Shipton Green & Co., a firm in which he later became a partner. Upon Mr. Green's retirement, Mr. Astlett became the senior partner and the firm name was changed to H. A. Astlett & Co. Mr. Astlett was a former president of the Rubber Trade Association and a former director of the Commodity Exchange of New York City. At the time of his death he was a director of the First National Bank of Montclair. A leading amateur orchid grower, Mr. Astlett was vice-president of the National Orchid Society and a strong supporter of the New York Zoological Gardens and the Museum of Natural History. He leaves a son and a daughter.

### *Kenneth F. Cooper*

Kenneth F. Cooper, who retired in 1947 as senior vice-president and director of the American Cyanamid Co., died on May 23 on his farm in Pine Plains, N. Y. He was 74 years old. Mr. Cooper was graduated from Stanford University as a civil engineer. After four years in various engineering positions on the West Coast, he joined the Muscle Shoals Electric Power Co. in Nashville, Tenn. When American Cyanamid was organized in 1907, Mr. Cooper joined the company and worked on the designs for its first plant at Niagara Falls, N. Y. From 1909 to 1912 he was works manager for the plant, and then became general manager of the company. In 1916 Mr. Cooper was elected a director and a vice-president, and in the ensuing years he became also an official of several affiliated companies. He was chairman of Cyanamid's Budget Committee and also served on the finance, pension and management coordinating committees. He is survived by his wife and two daughters.

### *William E. Barker*

William E. Barker, formerly associated with the U. S. Rubber Co., died on May 20 after a long illness. He was 88 years old. Born in Lynnfield Centre, Mass., Mr. Barker was president of the Enterprise Rubber Co. in Boston until it was taken over by the U. S. Rubber Co. He served 45 years with U. S. Rubber, retiring in 1930 as general sales manager of the Wire and Cable Division. Mr. Barker is survived by two daughters and a son.

### *Jerome T. Shaw*

Jerome T. Shaw, editor of "Tires—TBA Merchandising" for the past 35 years and president of the Greater New York Tire and Battery Association, died suddenly on May 26 at his Hastings-on-Hudson, N. Y., home. He was 65 years old. One of the early journalists in the automotive field, Mr. Shaw became editor of "Tires" in 1919, when it was founded. As a young

man he had covered the Glidden Tours and the Vanderbilt Cup Races for the *New York Tribune*. During the Nineteen Twenties and Thirties he wrote many feature articles for the *New York Times* on the tire industry. Active in trade organizations, he attended every meeting of the National Association of Independent Tire Dealers since its inception in 1920. In 1951, Mr. Shaw was made publisher of Tires, in addition to his duties as editor. He is survived by his wife, a son and two daughters.

### *Abraham Sydeman*

Abraham Sydeman, pioneer rubber products manufacturer, died on April 21 at his home in Jamaica Plain, Mass. He was 96 years old. Born in Poland, Mr. Sydeman came to this country before the turn of the century. He established the Plymouth Rubber Co., in Canton, Mass., and was one of the first manufacturers to promote rubber heels for men's shoes. Relinquishing control of Plymouth Rubber in 1919, he was unable to remain inactive, and five years later, at the age of 67, he organized the Stedfast Rubber Co., Boston, Mass. Mr. Sydeman remained an official of the company until his retirement less than six years ago. He is survived by his two daughters.

### *Dr. John R. Long*

Dr. John R. Long, research chemist for the Goodyear Tire & Rubber Co., died recently at his home in Stowe, Ohio. He was 46 years old. Born in Thomas, Okla., Dr. Long joined Goodyear in 1950. He was treasurer of the Akron area chapter of the American Chemical Society and a member of the American Institute of Chemical Engineers. He is survived by his wife.

# HERE'S EXPERIENCE THAT CAN HELP YOU WITH YOUR PROCESSING

When you need a process aid or have a problem involving one, it will pay you to take advantage of Sun's technical knowledge and experience in the field.

As early as 1937, working with leading rubber companies, Sun made commercially available a petroleum derivative remarkably suited for plasticizing Neoprenes, natural rubbers and reclaims. This was followed by a number of other process aids—among them Circosol-2XH, an elasticator that greatly improved the rebound properties of GR-S synthetics; and Sundex-53, a low-cost product highly compatible with natural rubbers, GR-S, reclaims, and various combinations of the three. Leadership in the field and knowledge of the industry's requirements brought about Sun's participation in the experimental work which led to the development of oil-extended synthetic rubbers.

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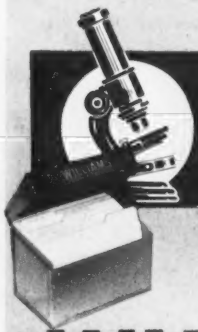

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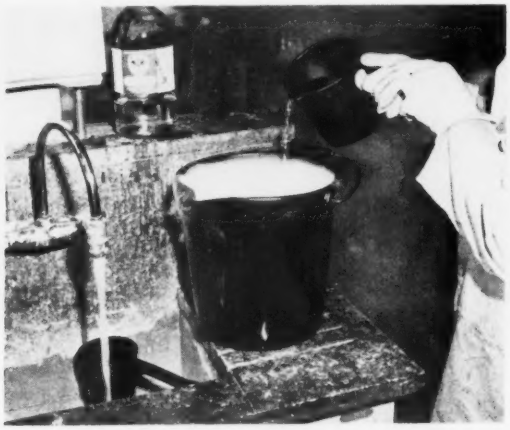
# NEW GOODS

## Stokes Rigid Rubber Pails

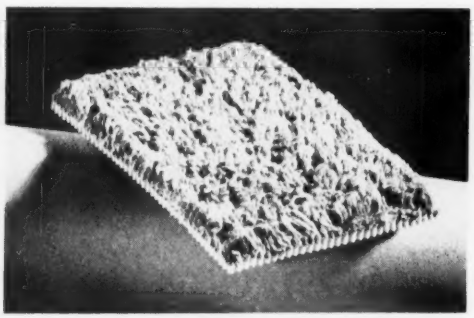
Sturdy, lightweight rigid rubber pails and dippers for handling corrosive liquids are now being offered by Stokes Molded Products, Inc., Taylor Street at Webster Avenue, Trenton 4, N. J. This equipment is said to be resistant to solutions of most acids, bases, salts and organic materials at temperatures up to 150°F. The pails and dippers are molded from "Stokolite L-44," a compound containing "Good-rite Resin 50" for



high impact strength, rigidity and excellent resistance to abrasion and chemicals. Good-rite Resin 50 is a product of the B. F. Goodrich Chemical Co. The pail is graduated and has a capacity of 3 gallons. It is equipped with a safety-grip hand hold on the bottom edge, a corrosion-resistant handle and a pouring spout for easy, accident-free pouring. The dippers come in 1 and 2 quart sizes with reinforced handles and special pouring lips.

## Duz-It Handy Pad

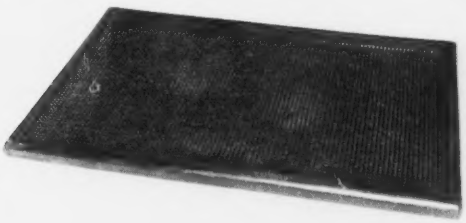
Crown Rubber Co. of Fremont, Ohio, is producing a new, home utility pad which can be used for a variety of household chores including dusting, padding and dry



polishing. Called the "Duz-It Handy Pad," the product is made of tufted cotton bonded to foam rubber. It is washable and will not slip. Available in six sharp colors, the pad is 5 x 7 inches in size.

## Mat-A-Dor Sanitary Mat

Mat-A-Dor Corp., 2302 University Avenue, Des Moines, Iowa, is presently marketing a new mat specifically designed to hold a disinfectant solution. Called "Mat-A-Dor," the product is said to be resistant to all recognized, standard disinfectants. The patented rubber mat has a sidewall ¾-inch wide and ⅞-inch high surrounding more than 5,100 rubber "fingers." The disinfectant is poured onto the mat and is kept from running off by the sidewalls. The rubber fingers



serve to clean the sole of the shoe at the same time immersing it into the disinfectant. Mat-A-Dor has a corrugated back to keep it from slipping or sliding. Molded of a specially compounded formula, the mat is tough and durable, yet live and springy. It may be used as a regular mat, without disinfectant, in the bath or as a door mat for home or industry. When used with a disinfectant, however, it finds a wide range of uses in hatcheries and poultry farms, dairies, food processing plants, hospitals, laboratories, etc., where sanitation is a must.

## Oak Rubber Balloon Pump-Pak

Oak Rubber Co., Ravenna, Ohio, has introduced a new novelty consisting of a combination of an air pump, 30 balloons and an illustrated party ideas folder. Called the "Balloon Pump-Pak," the pump also serves as the package for the balloons and folder. In operation, the

top is taken from the container and the balloons and folder removed. The top is replaced; a balloon is placed over the built in nozzle and inflated in a manner similar to that employed with an air spray gun. The pump can be saved and used again. The photograph above shows the pump being used to inflate a balloon.

Flocked rubber glove, illustrated above, was produced in Cellusuede's well-equipped sample department as part of an ever-expanding program to assist flock users with special problems.

**The unending variety of uses for Cellusuede Flock stirs the imagination of industry's most progressive minds. Cellusuede adds COLOR APPEAL in packaging, paper, and many other fields . . . gives an intriguing RICH TEXTURE to fabrics and toys . . . SILENCES unwanted noises when used as an acoustical material, everywhere from architecture to aircraft . . . DAMPENS VIBRATION in radio grills and phonograph turntables . . . INCREASES STRENGTH when used as a filler in plastics and rubber . . . thousands of uses, and every day designers, engineers, research and production men are finding more applications for Cellusuede Flock.**

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# The Best Method Yet Devised . . .

FOR DICING SHEET STOCK

## The Famous CUMBERLAND *"Stair-Step" Dicer*

Here at last is the answer to your problems of dicing rubber or vinyl sheet stock. Produces perfect cubes ranging in size from $\frac{1}{8}$ to $\frac{1}{2}$" by merely changing knives.

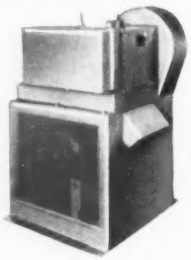
Comes in two sizes designed to handle sheets up to 7" or 14" in width. Other sizes made to order.

Input speeds range from 10 to 125 feet per min. depending on material and size of cube desired.

## The CUMBERLAND Rotary Chopping and Dicing Machine

*As a chopper*, this machine efficiently cuts rubber and vinyl slabs into small pieces. Two sizes available to handle stock widths up to 14 or 24 inches.

*As a dicer* in modified form, handles principally vinyl sheet stock. A less expensive machine though less universal than the "Stair-Step" Dicer shown above.



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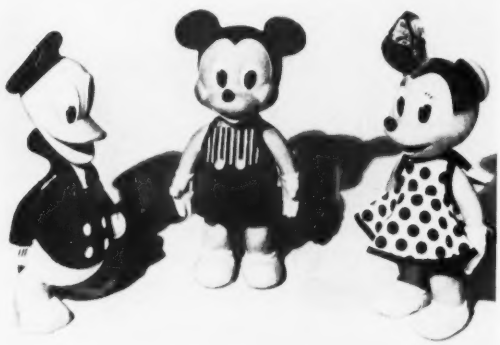
### Style MH Steam Cleaner Hose

Goodyear Tire & Rubber Co., Akron, Ohio, has added a new steam hose to its commercial line. Known as "Style MH Steam Cleaner" hose, the new product is designed to handle the difficult requirements of steam-cleaning application. Service demands of auto laundries, truck, bus and railroad maintenance shops require a lightweight, flexible, easy-to-handle, durable hose which can withstand the detrimental effect of cleaning. Style MH Steam Cleaner hose meets these rigid requirements. Available in ½- and ¾-inch sizes, it is recommended for use at 100 pounds water pressure where alkaline based cleaning solutions, such as caustic soda and similar detergents, are employed. It is not recommended for chlorinated solutions.

### Walt Disney Vinyl Dolls

Soft, vinyl doll reproductions of three favorite Walt Disney characters—Mickey Mouse, Minnie Mouse and Donald Duck—are now being manufactured by the Sun Rubber Co. of Barberton, Ohio. The dolls stand 11



inches high and make soft noises when cuddled. Mickey and Minnie are dressed in new cotton outfits—a red and white polka dotted dress with a gay hair ribbon for Minnie and a colorful striped sunsuit for Mickey. Donald Duck sports a blue sailor suit.

### Dubl-Flex Welding Hose

A new welding hose is being manufactured by the Goodyear Tire & Rubber Co., Akron, Ohio. The new product, "Goodyear Dubl-Flex Welding Hose," is designed to meet the demands of flexibility and handling required by the welding industry. A molded double line welding hose, consisting of a red line for acetylene and a green line for oxygen, the Dubl-Flex is produced in $\frac{3}{16}$- and ¼-inch sizes only.

### Cool-Cot Finger Tips

Spencer Rubber Products Co., Manchester, N. H., has introduced "Cool-Cot", an improved rubber finger tip which features an open back permitting the finger to "breathe". A unique "multi-S" suction grip facilitates positive, sure paper handling and speeds work. The new cots are available in rainbow pattern color or standard brick and amber shades in five sizes.

## Supreme Auto Seat Covers

A new line of automobile seat covers, which represent a new advance in seat cover styling, has been introduced by the Firestone Tire & Rubber Co., Akron, Ohio. Firestone "Supreme Plastic Tailorized" covers replace the square-edge appearance of conventional covers with smooth, flowing lines. The Supreme Plastic covers are easily installed because they utilize a strong rubber and fabric cable instead of the conventional "hog ring" hooks which require special tools and extra time. Constant tension provided by the rubber cable and by use of nylon Tricot material with a four-way stretch makes the covers hug contours of the seat and fit as smoothly as new car upholstery. Practically wearproof, woven Velon plastic extends over the edges of cushions and back rests to cover the points of maximum wear. Because seams are removed from the areas of contact, seam failure is eliminated. The new seat covers have a vertical stripe design of woven Velon with quilted plastic trim in simulated leather, and come in green, maroon and tan.

## Gam-En-Wood Plastic Flooring

A rugged new industrial flooring material, that can take heavy wear and is unaffected by chemicals, oil and grease, has been developed by the U. S. Rubber Co., New York, N. Y. Called "Gam-En-Wood," the new flooring is made of Enrup—a rubber-based plastic made by U. S. Rubber—bonded to solid or laminated hardwoods. The flooring is being manufactured in either strip or block form by Gamble Brothers Inc., of Louisville, Ky. The plastic surface of the new flooring has a high abrasion resistance. Most industrial chemicals, solvents, lubricating oils and grease will not affect it. It is non-conductive, fire resistant, resilient and sound-absorbing. It also has good non-slip qualities. Gam-En-Wood has been found suitable for use in rugged, long-wearing conveyor rolls which will not mar enameled products. The product's exceptional abrasion resistance was demonstrated by rolling a 200-pound weight over a length of roll conveyor 5,000,000 times. Wear was barely perceptible.

## Flexsteel Air Hose

Goodyear Tire & Rubber Co., Akron, Ohio, is manufacturing a new "Flexsteel" air hose designed to resist the rough, external conditions in the mining and quarrying industries. A mandrel-made hose, it has a heat and oil resistant tube and an impact and abrasion-resistant cover. Soft tan in color, the hose is reinforced with steel wire. Tests recently completed by the company's development engineers revealed the ruggedness and durability of the hose. Simulating field operating conditions, in which solid rubber and steel rim wheels frequently pass over hose, sample lengths, under high working pressure, were placed on a steel plate. Then a 3½-ton weight was dropped repeatedly on the sample in regular cycles. The crushing effect of the weight did not impair the operating efficiency of the hose, even though tested in excess of 5,000 cycles. Flexsteel air hose is now available in all popular sizes.

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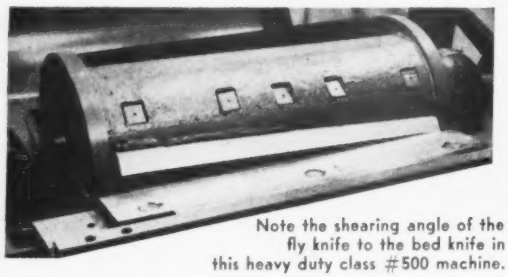
## TAYLOR-STILES CUTTERS

All Taylor-Stiles cutters give a shearing cut like this:

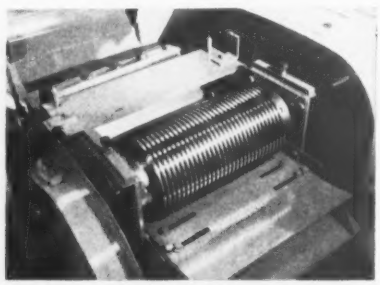


Note the shearing angle of the fly knife to the bed knife in this heavy duty class #500 machine.

Various models are available for a variety of uses.

## TAYLOR-STILES
### Pelletizers

employ a combination of disc cutting and shearing principles to pelletize sheet rubber or plastic stocks in a single continuous run through.



## TAYLOR-STILES
### Rubber and Plastics Tandem Cutters—

two cutting units set at an angle to each other to cut and cross cut sheet stock. Used primarily for cellulose acetate and other hard stocks.

Still other machines cut strips for feeding to extruders and another type cuts extruded rods into pellets.

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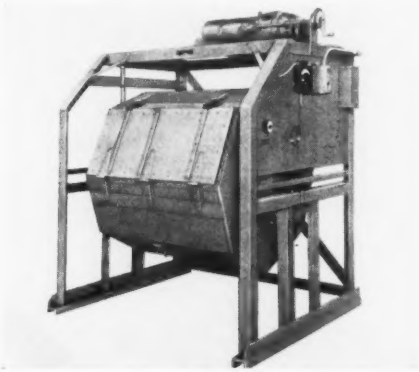
# NEW EQUIPMENT

## Low Temperature Tumbling Barrel

A new thermostatically-controlled low temperature tumbling barrel especially designed for deflashing parts molded of soft rubber has been introduced by Tumb-L-Matic, Inc., 4510 Bullard Ave., New York 70, N. Y. Although low temperature tumbling with dry ice is not new as a principle, this new barrel utilizing liquid $CO_2$ with constant control of low temperatures is said to produce tumbling results heretofore unattainable. A product of many years of test and development, this new tumbling technique is claimed to completely eliminate the storage area, storage and handling losses, and labor problems usually associated with dry ice tumbling. Liquid $CO_2$ is contained in a separate tank and fed through appropriate controls into the barrel where it expands and absorbs heat to provide the desired low temperature.



*View of the barrel designed for deflashing soft rubber parts.*

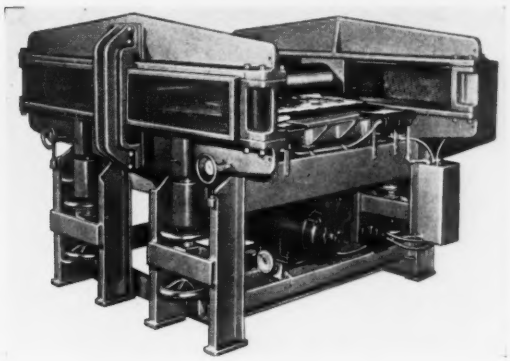
The new Tumb-L-Matic barrel has an operating temperature range of 0 to −120°F. Octagonal in shape, it is lined with stainless steel and insulated with 3-inch thick special material equivalent to 5 or 6 inches of conventional insulation. Pull-down is rapid. Often, tumbling is started immediately. Both operating and cooling times are 30 to 50% shorter than normal, yet results are uniform with minimum rejects.

Features include completely guarded chain drive, variable-speed gear-head motor with magnetic brake, hinged door with spring loaded latches, and manually-operated push-button control with thermal overload protection. The motor is supplied with voltage-rating to meet customer requirements.

The outside barrel of the unit has a 30-inch diameter and is 36 inches long, while the inside barrel has a 26-inch diameter and is 33 inches long. The over-all unit is 65 inches high, weighs 1200 pounds, and requires floor space of 46 x 58 inches. Other sizes can be manufactured to meet requirements. All liquid $CO_2$ controls are furnished completely assembled and installed. The indicating thermostat is manually set to maintain constant controlled temperatures. The barrel can be supplied without controls for operation with dry ice.

## Heavy-Duty Roller Die Cutter

A heavy-duty roller die cutter, capable of cutting foam and sponge rubber, uncured rubber, composition and rubber soles, molded rubber goods, and other types of materials, has been developed by the Falls Engineering and Machine Co., of Cuyahoga Falls, Ohio. With a greatly increased capacity, the new machine operates much like the lighter models previously built by the company in that it works on the same principle as a printing press. A motorized traversing steel roll moves in five seconds' time across the bed area of the machine,

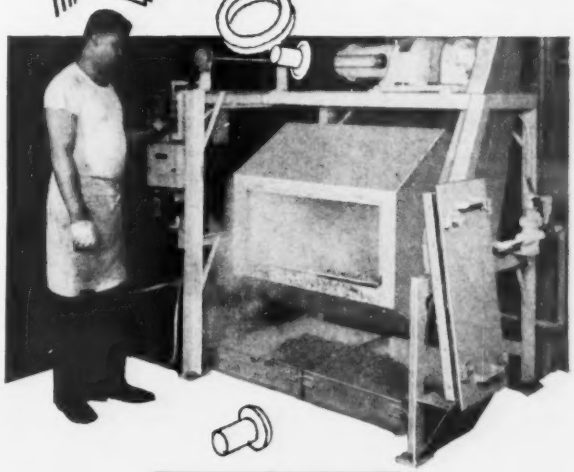


cutting and trimming the material by pressing it against steel rule dies. Sponge or foam rubber is utilized as a "kickout" medium to quickly eject the stock which has been die cut. According to the manufacturers, the extra strength and rigidity built into the new cutter enables it to absorb the impact of as many simultaneous cuts as there is room on the bed area for dies. The size of the bed area may be designed to suit the user's particular requirements. Special features emphasized by the manufacturer include time saving factors in handling a large number of cuts at one time, the use of inexpensive steel rule dies, and clean and accurate cutting and trimming, keeping "corking" or concave cutting to a minimum.

## New Universal Dillon Tester

A new universal tester featuring a daylight opening of 75 inches as compared to the company's previously tallest model with an opening of 40 inches has been added to the line featured by W. C. Dillon & Co., Inc., Van Nuys, Calif. Like other Dillon models it is "universal" in that it will test rubber, plastics, fabrics and other materials in tensile, compression, transverse and shear. The new tester has seven different capacities, ranging from 0-250 to 0-10,000 pounds. It can be hand or motor operated and is equipped with a red maximum pointer. A choice of either 5-inch or 10-inch diameter dial sizes and gripping fixtures is available. The mechanism is screw operated, has a positive drive, and has no drift. Ball bearings are used at all strategic points. It is a portable unit, the stand measuring 22 inches in width, 28¾ inches in height, and 15 inches in depth. Standard round, flat or special size specimens can be handled. It is available with either pound or kilo calibration.


NEW!



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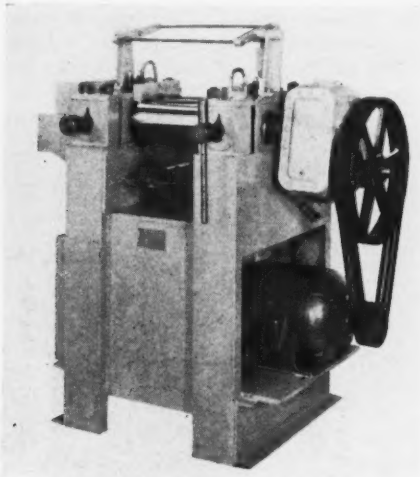
## Goodman Laboratory Mixing Mill

A 6 by 12-inch laboratory mixing mill has been added to the line of rubber machinery and equipment featured by G. F. Goodman & Son, Richmond St. and East Columbia Ave., Philadelphia 25, Penna. Batches between 6 ounces and 3 pounds can be handled conveniently on the rolls of the new unit. The rolls are of dense, close-grained cast iron which are flame-hardened $\frac{3}{16}$-inch deep, and then are hard chrome plated and polished. The chrome plate has the hardness of 93 Rockwell C and is .0015-inch thick. The roll neck journals are substantial, being 4 inches in diameter and 6 inches long to eliminate deflection and to provide a safe margin against breakage. Grease retainers are installed in the roll side of each journal box to prevent contamination of the stock.



The connecting gears are covered and pick up their lubricant from the lower case. They are easily changed for the various friction ratios and a 1:1 ratio is available for calendering. The convenient roll height—43 inches from the floor—meets all safety requirements. The roll pressure screws have adjustable pointers and the index plate is marked in increments of .010-inch to facilitate roll movement. The mill is equipped with stock guides and has an internal spray cooling system. It is 50½ inches wide, 32 inches deep, and 53¼ inches high, and weighs approximately 2800 pounds. The accompanying illustration shows the laboratory mill with guard removed to show brake motor and transmission units.

---

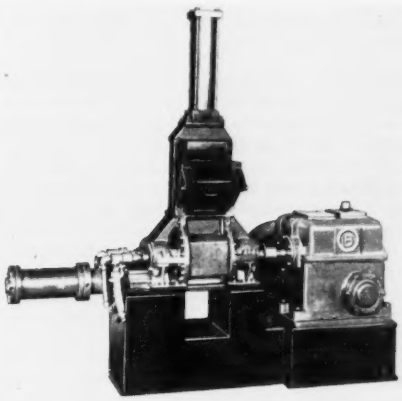
A new, redesigned **heavy-duty solution balance,** said to incorporate many new features, has been announced by the Ohaus Scale Corp., Union, N. J. Among the new features is the addition of a graduated end reading dial which enables the user to obtain a balancing position in a matter of seconds and eliminates the danger of any parallax errors.

---

Liston-Becker Instrument Co., Springdale, Conn., has added a **dual infra-red analyzer** to its line. This new unit, said to be the first to be made commercially available, provides within a single unit continuous analysis for two components in a complex gas stream.

## Bolling Intensive Laboratory Mixer

Stewart Bolling & Co., Inc., East 65th St., Cleveland 27, Ohio, has rounded out its line of intensive mixers with the addition of a laboratory size. The capacity of the new model is 6 pounds of 1.5 gravity stock for rubber and plastics. The company now has four production sizes of mixers with chamber capacities ranging



from 100 to 475 pounds. The new laboratory mixer has the same features as the larger production units, including spiral-flow sides for circulating water for cooling or steam for heating; split end frames for strength and accessibility to rotors, bearings, shroud plates and dust seals, and anti-friction bearings throughout. A 4-speed a.c. motor or variable speed d.c. drive is offered.

## Automatic Impact Tester

Designed for studying the dynamic properties of parts subject to shock, and for determining the breaking point of gear teeth, a new automatic progressive and repeat impact testing machine has been announced by the Tinius Olsen Testing Machine Co., 1088 Easton Road, Willow Grove, Penna. In operation, a hammer of known weight is automatically raised and dropped on the test specimen from progressively higher points until the specimen breaks. The quality of the material under test can be determined from the height of the fall at fracture and number of blows delivered. After each stroke, the hammer is picked up on the rebound by a motor-driven chain and raised to the next dropping point. Height of fall is increased by one inch increments for each succeeding stroke. The machine can also be set to deliver the impact repeatedly from any desired height between six inches and ten feet. The specimen holder can be adjusted to accommodate test materials up to 24 inches in height. T-slots are provided in the bed plate to facilitate positioning specimens of various shapes.

Palmer-Shile Co., Detroit 27, Mich., has announced a newly-designed **nesting stacking box** with a 6-inch nesting clearance between box tops. Loaded boxes may be stacked by crane or fork truck by simply lifting, turning and tiering on the lower box. The boxes are 45 inches long and 36 inches wide at the top, and have a depth of 23 inches.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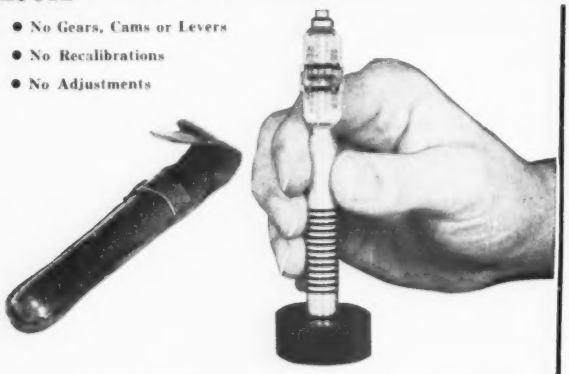

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# REVIEWS

## BOOKS

**Laboratory Instruments: Their Design and Application.** By A. Elliott and J. Home Dickson. Published by Chemical Publishing Co., 212 Fifth Avenue, New York, N. Y. 5¾ x 8¾ in. 414 pp. $7.50.

This book makes the point that the research worker is often called on to devise and construct his own instruments and finds his training inadequate to cover the many ramifications involved. In this regard, this volume will serve as a guide. The early chapters deal with the properties of various materials and their treatment and use in the construction of instruments. There is a chapter on the preparation of drawings for workshop use and their reproduction. Succeeding chapters are devoted to methods of construction to suit special requirements and in particular the kinematic design of instruments is treated at some length. There are chapters on vibration insulation, sensitivity, and methods of measurement. Chapters on glass and on the uses and working of glass are followed by a description of a number of optical instruments and devices. Many tables and diagrams illustrate the use of lenses, mirrors and prisms. It includes much information which is not generally found in books on optics. Finally, there is a chapter on the applications of photography and several appendices covering miscellaneous information.

•

**A Study of Trade Between Asia and Europe.** Published by the Department of Economic Affairs, United Nations, Geneva, Switzerland. Distributed in the United States by Columbia University Press, 2960 Broadway, New York 27, N. Y. 8½ x 11 in. 146 pp. $1.50.

This study, prepared by the Secretariats of the Economic Mission for Asia and the Far East, the Economic Commission for Europe, and the Food and Agriculture Organization of the United Nations, represents a joint effort on ways and means to increase trade between Asia and Europe on terms equitable and advantageous to the countries concerned. Of particular interest is an appendix on rubber which takes into consideration such factors as the supply background, Southeast Asian production and exports, characteristics of demand, European outlets, stockpiling, price development, synthetic rubber production, capacity and use, general use developments and prospects for the future. Pertinent statistical data are offered. The balance of this interesting study is devoted to comparable studies on such commodities as tea, jute, tin, rice, oil seeds, oils, oil-cake and meal, cotton and manufacturers, and carpet wool.

•

**Manual of Excellent Managements.** (1954 Edition). Published by the American Institute of Management, 125 East 38th Street, New York 16, N. Y. 8½ x 11 in. 96 pp.

This manual lists the 348 industrial organizations in the United States and Canada who have been cited as excellently managed. There are also supplementary lists showing the companies with the greatest growth potential, the best records of stability of net income, and the most outstanding outside boards of directors. In addition, the manual briefly discusses the management audit methods of the Institute, and analyzes the scope of the method and the reasons behind the entire operation of management auditing as it has been developed by A.I.M. The manual will enable everyone concerned with management appraisal and improvement to compare the management records of various companies, industries and areas, so that a more accurate judgment of a company's performance in management can be made, relative to the listed companies.

## BOOKLETS, CATALOGS, etc.

**Delayed Action Accelerators: NOBS No. 1 and NOBS Special.** (Rubber Chemicals Technical Bulletin No. 836). Intermediate and Rubber Chemicals Department, American Cyanamid Co., Bound Brook, N. J. 8½ x 11 in. 44 pp.

This bulletin establishes the premise that the use of reinforcing blacks has shown a steady growth since they became available in 1947. Their high pH values, which largely account for their fast curing rates and inherent scorching tendencies, require the use of good delayed action accelerators for safe processing. "NOBS Special Accelerator" has been designed to meet this requirement for maximum delayed action. While imparting the same excellent physical characteristics at optimum cure that "NOBS No. 1 Accelerator" does with reinforcing furnace blacks in both natural rubber and GR-S, it delivers that extra in delayed action that is so necessary for safe processing. This bulletin, then, covers the chemical and physical properties of both accelerators, and presents data showing the comparative results obtained when NOBS Special, NOBS No. 1 and N-cyclohexyl benzothiazole-2-sulfenamide are used as accelerators in a number of general formulations. Graphs illustrating the outstanding delayed action of the NOBS accelerators are also included.

•

**Nonstaining and Nondiscoloring Polygard Stabilized GR-S Polymers.** (Compounding Research Report No. 28). Naugatuck Chemical Division, U. S. Rubber Co., Naugatuck, Conn. 8½ x 11½ in. 16 pp.

After an introductory general description of "Polygard" stabilized GR-S polymers, with reference to stability, air-oven and hot milling tests, this report describes low ash polymers for wire and cable compounds which have been stabilized with the material. Also discussed is low Mooney polymer for sponge. Another section of the report is devoted to Polygard stabilized polymers for tire carcass and mechanicals. Cross-linked polymers for easy processing, a high styrene polymer for improved tensile strength in nonblack compounds, and a low ash rosin acid polymer for pressure sensitive tape, all stabilized with Polygard, are likewise covered. Characteristic of GR-S stabilized with the material are also considered.

•

**Indonex Plasticizers in Hard Rubber Compounds.** (Circular 13-49). Indoil Chemical Co., 910 South Michigan Avenue, Chicago 80, Ill. 8½ x 11 in. 4 pp.

Another circular in the series on uses for "Indonex" plasticizers, this publication provides a general discussion of their use in natural rubber, GR-S and other synthetic rubbers. Other information furnished includes data on the compatibility of Indonex with a wide variety of natural and synthetic resins, waxes and pitches. Two series of compounds are shown, the first representing a medium quality product suitable for storage battery covers, cover frames and knobs for deep freeze units, etc., while the second is a series of low cost compounds heavily loaded with coal dust and suitable for battery boxes.

•

**Single Stage Rotary Compressors—Vacuum Pumps.** (Bulletin 16B8126). Allis-Chalmers Manufacturing Co., 979 S. 70th Street, Milwaukee 1, Wisc. 8¼ x 10¾ in. 12 pp.

The operation and construction of Allis-Chalmers single stage water cooled rotary compressors and vacuum pumps applicable to every air or gas handling requirement are described in this bulletin. Eight reasons are cited why these compressors and vacuum pumps provide more air at less cost. The bulletin also gives general specifications for the units along with typical air piping arrangement diagrams and proper accessories designed to give the most satisfactory results.

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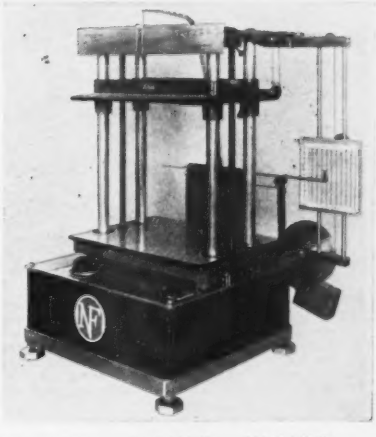

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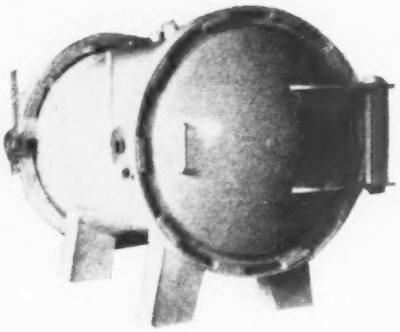

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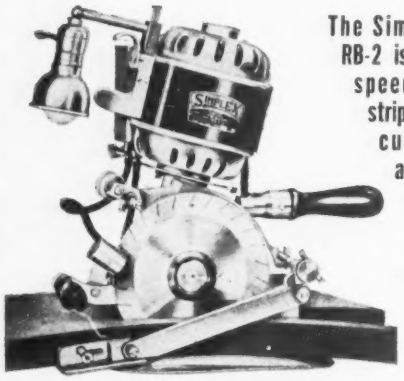

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## REVIEWS (CONT'D)

**Cabot Carbon Blacks Under the Electron Microscope.** (Second Edition). Godfrey L. Cabot, Inc., 77 Franklin Street, Boston 10, Mass. 9 x 11 in. 100 pp.

The first detailed study of the particle size of Cabot carbon blacks was published in October, 1949. Since this first edition was issued, furnace blacks have become of ever-increasing significance. Today, the total volume of furnace blacks consumed in all applications exceeds that of channel blacks, and the trend will doubtless continue until furnace blacks eventually fill all but a few highly specialized applications. This second edition contains data on seven new Cabot carbon blacks which have been developed since the first edition of this publication was issued. Regardless of the method of manufacture, particle size and surface area are still primary factors in determining the properties of carbon black. The data presented in this publication should prove helpful not only in interpreting the behavior of each grade of carbon black in present uses, but also in selecting the proper grades of carbon black for new applications.

•

**Thiokol Synthetic Rubbers.** Thiokol Chemical Corp., Trenton 7, N. J. 8½ x 11½ in. 4 pp.

This bulletin describes the use of Thiokol synthetic rubbers in a number of applications, including paint spray, gasoline and automatic fuel hose, printing and coating rollers, molded diaphragms and gaskets, and coated paper gaskets. The advantageous properties contributed by the Thiokol rubbers are discussed. One section of the bulletin is devoted to an outline of the typical properties of the material. The publication is illustrated with several photographs.

•

**The Rubber Formulary: A Service to Compounders.** Rubber Formulary, P. O. Box 1568, Bakersfield, Calif. 5¼ x 8 in. 20 pp.

This booklet describes the Rubber Formulary, the monthly rubber abstracting service now in its seventh year. The functions of the Formulary are outlined by means of answers to the questions most frequently asked. The present booklet is the third edition of this publication and represents an enlargement of previous information. A sample punched Formulary card is included with the booklet.

•

**Milton Roy Motor-Driven Controlled Volume Pumps.** (Bulletin 553). Milton Roy Co., 1300 E. Mermaid Lane, Chestnut Hill, Philadelphia 18, Penna. 8½ x 11 in. 40 pp.

This bulletin contains valuable information covering design and construction of Milton Roy motor-driven controlled volume pumps. Other technical data includes capacity-pressure selection tables; types of capacity adjustments; standard and special designs, as well as packaged systems.

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**Natural Rubber: Some Activities in the Field of Development.** International Rubber Development Board, Market Buildings, Mark Lane, London, E.C. 3, England. 8¼ x 10¾ in. 32 pp.

Since the International Rubber Study Group Meeting held in London in March-April, 1949, the International Rubber Development Committee has made available to the Group an annual review of the development work, financed by producers, directed to extending the uses of natural rubber. Such activities for 1953 are outlined in this handsome booklet, covering such subjects as rubber in road surfaces, rubber in transportation, in agriculture, new applications for rubber and latex, a review of progress in technically classified rubber, publicity activities and publications designed to encourage the use of natural rubber. The booklet is published in both French and English.

■

**dbpc Antioxidant.** (Bulletins C-4-115 and C-4-197). Chemical Division, Koppers Co., Inc., Pittsburgh 19, Penna. Both 8½ x 11 in. C-4-115 has 14 pp. C-4-197 has 16 pp.

Detailed descriptions, technical and non-technical, and suggested uses of "dbpc" antioxidant are contained in these two new bulletins. Technical Bulletin C-4-115 furnishes toxicological information, descriptions of chemical reactions, and commercial information on this product, which has been tested and proved effective as an antioxidant for fatty foods and hydrocarbon materials such as petroleum products, rubber and plastics. Technical Bulletin C-4-197, contains information in non-technical language on the use of the product in rubber, plastics, food, insulating oils, petroleum fuels, lubricants and waxes, and non-edible animal and vegetable oils.

■

**Acrylonitrile.** (Technical Bulletin F-8381). Carbide and Carbon Chemicals Co., 30 East 42nd St., New York 17, N. Y. 8½ x 11 in. 8 pp.

The reactions of acrylonitrile and its major uses are described in this technical bulletin. Properties, constant-boiling mixtures, specifications, and shipping data are included. It is said that acrylonitrile lends many desirable properties to polymeric materials used in the preparation of synthetic fibers, rubber, and plastics. Its polymers are used in treating textile, leather, and paper; in surface coatings; and in oil-well drilling muds and soil conditioners. Acrylonitrile reacts to form compounds used as solvents and plasticizers, and as intermediates for pharmaceuticals, insecticides, and dyes.

## Application of Radiometric Procedures

(*Continued from Page 384*)

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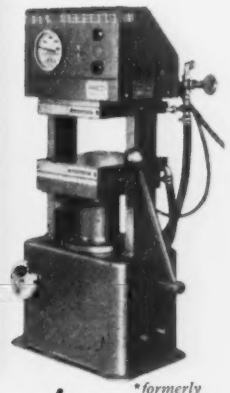

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# MARKETS

# NEWS-PRICES

**NEW YORK, JUNE 4, 1954**

## Natural Rubber

Since our last report (May 5), the average price of spot rubber on the New York Commodity Exchange has moved in a range of 138 points, high for the period being 22.50c reached on May 19, 20 and 28, and again on June 4 and 5. The low for the period was 21.12c reached on May 11. The average price of spot rubber for the month of May was 21.96c based on 20 trading days. This compares with 22.06c in the previous month.

Steady markets have been reported during the past few weeks with the volume of business rather restricted. The spread between the top grades of Ribs and the low grades is now negligible. This should lead, the trade believes, to a progressive increase in consumer demand for No. 1 R. S. S. As a matter of fact, the interest from manufacturers in the top grades is greater today than at any time in months. This demand should gradually take up the slack in the No. 1 R. S. S.

The estimates recently made of world consumption and production of natural and synthetic rubber by the International Rubber Study Group do not find acceptance in all quarters in London, foreign advices state. While in total it is accepted that world output of natural will be in the neighborhood of 1,705,000 tons in 1954, the breakdown is questioned. In the case of Indonesia, a production figure of 661,000 tons has been given for 1954.

Taking Indonesian smallholders' exports to be in the order of 400,000 tons this year, and 300,000 for the estates, the total figure of 661,000 tons for 1954 is regarded, in some quarters at least, as far too low.

The estimate for world consumption of natural rubber of 1,681,000 tons, on the other hand, is thought to be rather high. In general, however, provided the price of natural rubber does not rise much above its present level and lead to a cut in U. S. consumption, the statistical position for this year is believed to be not unfavorable.

### *Scores U. S. Policy*

At the 45th annual general meeting of the Kampong Kuantan Rubber Co., Ltd., held recently at London, E. D. Money, chairman of the company, stated that the future of the industry depends largely upon the ability of producers to find markets for crops of rubber other than standard smoked sheet which, at any time, can become difficult to sell other than at a cut price dictated largely by U. S. policy.

He stated that it is more than useless for producers to protest in regard to the considered policy of a powerful nation which has little interest in the prosperity of any industry owned by foreign nationals. Although there may be sound political arguments in favor of U. S. aid to Malaya, it is unfortunate, he declared, that the U. S. would rather hand out dollars and equipment free, by way of charity, than legislate in favor of fair trading methods which might produce unpleasant reactions from voters and members of Congress of both parties.

## Price Data

### Closing Rubber Prices on New York Commodity Exchange (No. 1 R.S.S. Contract)

FROM MAY 5 TO JUNE 4

| May | Spot | July | Sept. | Dec. | Mar. | Sales |
|---|---|---|---|---|---|---|
| 5 | 21.62 | 21.71 | 22.25 | 22.75 | 23.15 | 69 |
| 6 | 21.38 | 21.75 | 22.07 | 22.65 | 22.87 | 117 |
| 7 | 21.50 | 22.05 | 22.40 | 22.95 | 23.20 | 89 |
| 8 | .... | .... | .... | .... | .... | .... |
| 9 | .... | .... | .... | .... | .... | .... |
| 10 | 21.25 | 21.70 | 22.00 | 22.25 | 22.65 | 65 |
| 11 | 21.12 | 21.55 | 21.95 | 22.45 | 22.60 | 61 |
| 12 | 21.50 | 22.00 | 22.30 | 22.85 | 23.05 | 93 |
| 13 | 22.00 | 22.40 | 22.60 | 23.25 | 23.42 | 92 |
| 14 | 22.00 | 22.40 | 22.65 | 23.25 | 23.55 | 74 |
| 15 | .... | .... | .... | .... | .... | .... |
| 16 | .... | .... | .... | .... | .... | .... |
| 17 | 22.00 | 22.50 | 22.75 | 23.29 | 23.52 | 21 |
| 18 | 22.38 | 22.90 | 23.15 | 23.69 | 23.90 | 95 |
| 19 | 22.50 | 22.95 | 23.10 | 23.60 | 23.85 | 37 |
| 20 | 22.50 | 22.80 | 23.10 | 23.55 | 23.79 | 31 |
| 21 | 22.25 | 22.65 | 22.85 | 23.30 | 23.40 | 76 |
| 22 | .... | .... | .... | .... | .... | .... |
| 23 | .... | .... | .... | .... | .... | .... |
| 24 | 22.00 | 22.60 | 22.75 | 23.28 | 23.50 | 8 |
| 25 | 22.00 | 22.30 | 22.40 | 22.94 | 23.15 | 91 |
| 26 | 22.12 | 22.55 | 22.75 | 23.20 | 23.35 | 45 |
| 27 | 22.38 | 22.65 | 22.85 | 23.35 | 23.41 | 82 |
| 28 | 22.50 | 22.75 | 23.00 | 23.40 | 23.45 | 40 |
| 29 | .... | .... | .... | .... | .... | .... |
| 30 | .... | .... | .... | .... | .... | .... |
| 31 | .... | .... | .... | .... | .... | .... |
| June | | | | | | |
| 1 | 22.38 | 22.40 | 22.73 | 23.05 | 23.15 | 41 |
| 2 | 22.38 | 22.55 | 22.88 | 23.15 | 23.33 | 33 |
| 3 | 22.50 | 22.78 | 23.04 | 23.28 | 23.35 | 50 |
| 4 | 22.50 | 22.70 | 23.00 | 23.20 | 23.35 | 16 |

### Outside Market

| | |
|---|---|
| No. 1 Ribbed Smoked Sheets: | |
| Spot | .22½ |
| June | .22½ |
| July | .22⅝ |
| Thin Latex Crepe: | |
| Spot | .25¼ |
| Thin Brown Crepe, No. 2 | .22 |
| Smoked Blankets | |
| Flat Bark Crepe | .17 |

### London Market

*(Standard Smoked Sheets)*

| | |
|---|---|
| July | 22.32 - 22.46 |
| Oct.-Dec. | 22.61 - 22.76 |

### Singapore Market

*(Standard Smoked Sheets)*

| | |
|---|---|
| July | 20.92 - 20.99 |

### Synthetic Rubber

*(Dry Types—Per Pound)*

| | |
|---|---|
| Butaprene NF | .490 - .500 |
| Butaprene NL | .500 - .510 |
| Butaprene NAA | .540 - .550 |
| Butaprene NXM | .580 - .590 |
| Chemigum 30N4NS | .500 - .510 |
| Chemigum 50N4NS | .500 - .510 |
| Chemigum N3 | .580 - .590 |
| G-E Silicone Rubber (compounded) | 2.50 -3.60 |
| G-E Silicone Gum (not compounded) | 4.00 -4.20 |
| GR-I | —— - .220 |
| GR-S | —— - .230 |
| Hycar OR-15 | .580 - .590 |
| Hycar OR-25 | .500 - .510 |
| Hycar OS-10 | .550 - .560 |
| Neoprene Types AC and CG | —— - .550 |
| Neoprene Type GN | —— - .410 |
| Neoprene Type GN-A | —— - .410 |
| Neoprene Type GRT | —— - .420 |
| Neoprene Type KNR | —— - .750 |
| Neoprene Type Q | —— -1.00 |
| Neoprene Type S | —— - .420 |
| Neoprene Type W | —— - .410 |
| Neoprene Type WRT | —— - .450 |
| Paracril B | .500 - .510 |
| Paracril BJ | .500 - .510 |
| Paracril C | .580 - .590 |
| Silastic (compounded) | 1.95 -3.38 |
| Thiokol Type A | —— - .470 |
| Thiokol Type FA | —— - .640 |
| Thiokol PR-1 | —— - .950 |
| Thiokol Type ST | —— -1.000 |

### Middling Upland Quotations

| | May 4 | June 4 | | |
|---|---|---|---|---|
| | Close | High | Low | Close |
| July | 34.42 | 33.42 | 34.25 | 34.27 |
| Oct. | 33.87 | 34.18 | 34.12 | 34.13 |
| Dec. | 33.84 | 34.18 | 34.13 | 34.13 |

## Synthetic Rubber

A report has been circulating in oil and rubber circles in London that the Esso refinery at Fawley, near Southampton, is preparing to manufacture Butyl rubber. Esso officials say that this is a "serious possibility," but that no decision has been made. They point out that the American parent company may decide to produce this type of synthetic at Fawley, in France, or in Germany, where a new Esso refinery has been opened at Hamburg. It is said that Fawley is the most significant source of butylene in Great Britain, but the refinery has other profitable uses for the materials needed to make it.

As reported elsewhere in this issue, the Reconstruction Finance Corporation has released figures on GR-S production and sales for the June-August period. These figures were most interesting, the trade believes, in that production in June was revised upward by 1,000 tons and sales were up 500 tons, while both production and sales for July were 2,000 tons greater than the figures announced in April. The August figures showed sales 8,000 tons more than July, but production was only 800 tons more.

The trade generally was not ready to accept the reason for the sharp increase in August sales as being due to inventory adjustments by large consumers. Yet, it is difficult not to accept this as part of the reason. After all, trade sources state, the oil-extended rubbers are finding a ready market. This would indicate that the increased sales are in the rubber which has a base price of 23c a pound.

Some feel that in view of the indicated prospective betterment in the statistical position of natural rubber, manufacturers may be somewhat apprehensive over the impact on the price structure and therefore are anticipating eventualities with increased purchases of synthetic rubber. Then again, particular significance is also being attached to the increased rate of production from earlier schedules.

### *Price Differentials*

Rising prices for natural rubber have gone a long way toward making manufacturers more conscious of the price differentials between grades and the fact that in many products, synthetic rubber is again more attractive than natural.

Manufacturers, it is believed, will look at synthetic more favorably for several reasons, including the desire to maintain an historical continuity in the event of more serious international political considerations. The price of synthetic rubber is now more attractive and the cost of buying synthetic rubber is nominal. A translation of this thinking into action must result in greater rubber surpluses.

Preliminary figures available from the U. S. Department of Commerce indicate that in the first four months of this year, 162,539 long tons of GR-S were produced. This compares with the 242,290 long tons produced in the first four months of the preceding year.

The figures also show that in the first four months of this year, 160,762 long tons were consumed, against the 238,841 long tons consumed in the first four months of the previous year. In the same period of 1954, 3,278 long tons of GR-S were exported, against the 1,718 long tons exported in the first four months of 1953. As for stocks on hand, at the end of the first four months of the current year, the Department's figures show that there were 136,511 long tons available. At the end of the first four months of 1953, there were 89,839 long tons on hand.

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# MARKETS

## NEWS-PRICES

**NEW YORK, JUNE 4, 1954**

## Reclaimed Rubber

For one supplier, at least, there seemed to be a decided business upturn in May. Others, however, did not report nearly such happy circumstances. Automotive items accounted, in large measure, for what business there was. Some of the grades showing more than usual interest are Butyl tube reclaim and non-staining reclaim.

First quarter profits for the reclaimers have not been good, but an anticipated heavier volume of business in the second quarter should have a beneficial effect. Prices remain steady and no major price changes are anticipated.

The U. S. Department of Commerce reports that 85,877 long tons of reclaimed rubber were produced in the first four months of this year, about 20,000 long tons less than that produced in the comparable period of the preceding year. About 83,219 long tons were consumed in the first four months of 1954, against 103,271 in the first four months of 1953.

*(Prices for All Areas Except Calif.)*

| | per lb. |
|---|---|
| Premium Grade Whole Tire | .10½ |
| First Line Whole Tire | .10 |
| Second Line Whole Tire | .09½ |
| Third Line Whole Tire | .09¼ |
| Fourth Line Whole Tire | .08¾ |
| Black Carcass | .14¼ |
| No. 1 Light Colored Carcass | .20¾ |
| No. 1 Select Peel | .11¾ |
| No. 1 Peel | .10½ |
| Butyl Tube Reclaim | .12½ |
| Natural Rubber Black Tube | .15 |
| Natural Rubber Red Tube | .21 |
| Natural Rubber Gray Tube | .21 |

## Scrap Rubber

At the beginning of the period, slightly more activity was noted in the scrap rubber market. As the weeks passed, however, the market resumed its limited nature. A fair movement has been noted in black natural tubes. Some quarters were hopeful that June orders, particularly for mixed auto tires, would be in the nature of an improvement.

Prices, by and large, are still being regarded as nominal for most grades. At one point, fair consumption was reported on the part of reclaimers, but in the latter part of the period under review, this too slowed.

The U. S. Department of Commerce has released final figures on exports of scrap rubber for 1953 showing that 13,738 long tons were exported during the year. The total value of this tonnage was reported as $823,175 by the Department. Current prices follow:

*(Prices Delivered Akron)*

| | | |
|---|---|---|
| Mixed tires | ton | 13.50 |
| Light colored carcass | lb. | .05½ |
| No. 1 peelings | ton | 48.00 |
| No. 2 peelings | ton | 30.00 |
| No. 3 peelings | ton | 24.00 |
| Buffings | ton | 18.00 |
| Truck and Bus S.A.G. | ton | 17.00 |
| Passenger S.A.G. | ton | 15.00 |
| Natural Rubber Red Tubes | lb. | .09 |
| Natural Rubber Black Tubes | lb. | .05½ |
| Butyl Rubber Tubes | lb. | .02½ |

## Tire Fabrics

According to recent trade reports, the rayon tire cord industry is in its eighth month of decline in shipments, although 1953 saw quite a high production of high tenacity yarns for tires and other industrial applications. Total production last year exceeded 465,000,000 pounds, despite a tapering off after September.

This drop is said to be due to a revised policy on the part of tire manufacturers, which since last summer have been playing the supply situation "very close to the vest." As a result of this system of purchasing, the trade reports, the outlook for tire yarns is less rosy than it has been at any time since the end of World War II.

Barring the end of a sudden military emergency, the tire cord industry is said to be well able to handle the needs of the automobile industry at its current rate of production. Although shipments have dipped in successive months since last September, the industry is still producing at a relatively high rate.

The total production for the first quarter of this year was 98,400,000 pounds, a drop of 4% from the fourth quarter of 1953, and 19% below the production in the first quarter of 1953, which was 117,000,000 pounds.

In shipments to the tire and industrial trades there was a similar decline in the first quarter of this year, compared with last. There were 115,800,000 pounds shipped in the first quarter of 1953, and 94,700,000 pounds shipped in the first quarter of this year.

Last year, when the tire cord industry produced 465,000,000 pounds of yarn, the automobile industry was producing at a rate of 6,100,000 passenger cars and 1,000,000 trucks. This was close to the peak year of 1950, when 6,700,000 passenger cars and about 1,500,000 trucks were manufactured.

This year, many estimates of automobile production place it at between 5,000,000 and 5,300,000 passenger cars and less than 1,000,000 trucks. This is a considerable cut in production from rates prevailing in the past few years, but a corresponding cut in tire cord demand will not result this year because of the large replacement needs of the other millions of cars now in use.

Nevertheless, the drop in car production will have some effect on demand. Another important factor is expected to be the reduction in retail tire sales for replacement this year as a result of closer buying policies among consumers.

Although the industry is operating on a curtailed basis, and the prospects for sales have been dimmed for 1954, the price outlook for tire cord yarns is still reported to be good. Industry spokesmen say there is no present prospect of a decline in prices despite lower demand.

*(Prices f.o.b. Shipping Point)*

**Rayon Tire Cord**

| | | |
|---|---|---|
| 1100 | lb. | .76½ |
| 1650 | lb. | .73½ |
| 2200 | lb. | .73 |

**Nylon Tire Cord**

| | | |
|---|---|---|
| 210 | lb. | 2.00 |
| 840 | lb. | 2.00 |

**Rayon Graded Fabric**

| | | |
|---|---|---|
| 1100 | lb. | .72 |
| 1650 | lb. | .69½ |
| 2200 | lb. | .68½ |

**Cotton Chafers**

| | | |
|---|---|---|
| 14.4 oz. (per square yard) | lb. | .71 |
| 9.25 oz. (per square yard) | lb. | .66½ |
| 11.65 oz. (per square yard) | lb. | .63 |
| 8.9 oz. (per square yard) | lb. | .68 |

## Liquid Latex

**Natural:** According to Latex & Rubber, Inc., preliminary consumption reports for March confirm the general feeling of sustained high levels of consumption. Recent price advances have not been large enough to seriously affect Hevea's share of the product market. Long range estimates of U. S. consumption are still in the order of 6,000 tons per month for the balance of this year. However, by the light of present consumption rates, the 6,000 ton estimate may be slightly conservative.

In the rest of the world, consumption still appears to be at a high level and informed sources expect its steadily rising rate to continue. Sentiments expressed from overseas indicate that current European demand, while slow during recent months, has been awakened and is strong for nearby lots and moderate for future supplies. During the past period Hevea latex in bulk lots, East Coast, has ranged from 30½ to 32½c.

**Synthetic:** It has been reported by the U. S. Department of Commerce, that in the first four months of this year, 16,195 long tons of GR-S latex were produced, 14,742 long tons consumed, and that stocks at the end of the period stood at 5,359 long tons.

As for neoprene latex in the same period, 2,846 long tons were produced, 2,432 long tons were consumed, and stocks at the end of the period stood at 1,045 long tons.

The Department reports that in the same period 1,790 of N-type latices were produced, 1,158 long tons consumed, and stocks at the end of the period stood at 580 long tons.

## Cotton

The price of middling uplands on the New York Cotton Exchange has moved in the extremely narrow range of 30 points since our last report (May 5), high for the period being 35.45c reached on May 17, 25 and 26, and again on June 1, while the low of 35.15c was reached on May 11 and again on May 12. The average price of middling uplands for the month of May was 35.34c based on 20 trading days. This compares with an average of 35.22c in April.

Prospects of a much smaller crop than usual this year and the recent sharp increase in the export demand are expected to go a long way in alleviating the cotton surplus, the trade reports. It has been estimated that plantings this season are some 5 to 6% below the national allotment of 21,379,000 acres. On the basis of the average acre yield for the last five years, this would indicate a crop of about 11,600,000 bales.

The Department of Agriculture advises that U. S. cotton exports this season could increase perhaps to 5,000,000 bales from the current 3,600,000 figure, if foreign consumption and production are maintained at their present levels into the future.

Approximately $50,000,000 worth of surplus cotton has been cleared under a special agricultural disposal program for Italy, Spain, France, West Germany and Finland, trade sources state. The surplus disposal program, authorized by Congress last year, permits the exchange of surplus crops, including cotton, in exchange for foreign currencies. This program expires June 30, with terminal delivery of cotton on June 15.

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# CURRENT MARKET PRICES

## of rubber chemicals and compounding ingredients

**JUNE 3, 1954**

Prices are, in general, f.o.b. works and cover the domestic markets only. Export prices, as a rule, are usually slightly higher, due to packing regulations, special handling, etc.

Abbreviations: bbls., barrels; c.l., carlot; cyl., cylinder; dlvd., delivered; dms., drums; eqld., equalized; l.c.l, less than carlot; M.B., masterbatch; min., minimum; ref., refined; sap., saponified; sp., special; syn., synthetic; t.c., tank cars.

*For Export Only

The arrangement of this section closely follows the Chemical Section of the 1953-54 RUBBER RED BOOK. Readers are referred to the RUBBER RED BOOK for the correct classification of any material or brand name. Suppliers of every material are contacted for price information. However, only those materials are listed for which quotations have been furnished within the past six months. The quotations are not guaranteed and prospective purchasers should contact suppliers for information. Suppliers are requested to send current price information to the Market Editor, RUBBER AGE.

### ACCELERATORS

| | | | | |
|---|---|---|---|---|
| A-1 (Thiocarbanilide) | lb. | .50 | - | .57 |
| A-32 | lb. | .66 | - | .80 |
| A-100 | lb. | .52 | - | .66 |
| Accelerator No. 8 | lb. | — | - | 1.10 |
| Accelerator—49 | lb. | .53 | - | .54 |
| Accelerator—552 | lb. | — | - | 2.25 |
| Accelerator—808 | lb. | .66 | - | .68 |
| Accelerator—833 | lb. | 1.17 | - | 1.19 |
| Accelerator B | lb. | — | - | .89 |
| Altax | lb. | .48 | - | .50 |
| Ancap * | lb. | .38 | - | .40 |
| Ancatax * | lb. | .48 | - | .50 |
| Ancazate * BU (ET & ME) | lb. | — | - | 1.04 |
| Ancazide * ET | lb. | — | - | 1.04 |
| ME | lb. | — | - | 1.14 |
| Arazate | lb. | — | - | 2.25 |
| Beutene | lb. | .66 | - | .68 |
| Bismate, Rodform | lb. | — | - | 3.00 |
| Butasan | lb. | — | - | 1.04 |
| Butazate | lb. | — | - | 1.04 |
| Butyl Accelerator 21 | lb. | — | - | .89 |
| Butyl Eight | lb. | 1.10 | - | 1.35 |
| Captax | lb. | .38 | - | .40 |
| C-P-B | lb. | — | - | 1.95 |
| Cumate, Rodform | lb. | — | - | 1.45 |
| Dibenzo G-M-F | lb. | — | - | 2.60 |
| Diorthotolylguanidine | lb. | .57 | - | .58 |
| Diphenylguanidine | lb. | .48 | - | .49 |
| El-Sixty | lb. | .50 | - | .57 |
| Ethasan | lb. | — | - | 1.04 |
| Ethazate | lb. | — | - | 1.04 |
| Ethyl Thiurad | lb. | — | - | 1.04 |
| Ethyl Tuex | lb. | — | - | 1.04 |
| Ethylac | lb. | .93 | - | .95 |
| G-M-F | lb. | — | - | 2.60 |
| Guantal | lb. | .57 | - | .64 |
| Harvex | lb. | .62 | - | .68 |
| Hepteen | lb. | .44 | - | .46 |
| Base | lb. | — | - | 1.85 |
| Kure-Blend MT | lb. | — | - | .70 |
| Ledate, Rodform | lb. | — | - | 1.04 |
| MBT-XXX | lb. | .49 | - | .51 |
| Merac | gal. | .75 | - | 1.05 |
| Mercaptobenzothiazole | lb. | .38 | - | .40 |
| Mercaptobenzothiazyl Disulfide | lb. | .48 | - | .50 |
| Mertax | lb. | .49 | - | .56 |
| Methasan | lb. | — | - | 1.04 |
| Methazate | lb. | — | - | 1.04 |
| Monex | lb. | — | - | 1.14 |
| Mono Thiurad | lb. | — | - | 1.14 |
| Morfex | lb. | .65 | - | .67 |
| 2-MT | lb. | — | - | 1.00 |
| NA-22 (for neoprene) | lb. | — | - | 1.50 |
| NOBS No. 1 | lb. | .69 | - | .71 |
| Special | lb. | .79 | - | .81 |
| O-X-A-F | lb. | .49 | - | .51 |
| Pentex | lb. | — | - | 1.04 |
| Flour | lb. | — | - | .21 |
| Permalux (for neoprene) | lb. | — | - | 2.17 |
| Phenex | lb. | .52 | - | .57 |
| Pip-Pip | lb. | — | - | 2.25 |
| Polyac | lb. | — | - | 1.65 |
| R-2 Crystals | lb. | — | - | 2.45 |
| Rotax | lb. | .49 | - | .51 |
| RZ-50 | lb. | — | - | 1.00 |
| B | lb. | — | - | 1.00 |
| SA 52 | lb. | — | - | 1.14 |
| SA 57 | lb. | — | - | 1.04 |
| SA 62 | lb. | — | - | 1.04 |
| SA 66 | lb. | — | - | 2.60 |
| SA 67 | lb. | — | - | 1.04 |
| SA 77 | lb. | — | - | 1.04 |
| Santocure | lb. | .69 | - | .76 |
| Selenac (Ethyl, Methyl) | lb. | — | - | 2.60 |
| Setsit-5 | lb. | .75 | - | 1.05 |
| SPDX-GH | lb. | .64 | - | .69 |
| GL | lb. | — | - | .95 |
| Tellurac | lb. | — | - | 1.45 |
| Tepidone | lb. | .45 | - | .48 |
| Tetrone A | lb. | — | - | 1.91 |
| Thiofide | lb. | .48 | - | .55 |
| S | lb. | .51 | - | .58 |
| Thionex | lb. | — | - | 1.14 |
| Thiotax | lb. | .38 | - | .45 |
| Thiurad | lb. | — | - | 1.14 |
| Thiuram E | lb. | — | - | 1.04 |
| M | lb. | — | - | 1.14 |
| Trimene | lb. | .56 | - | .58 |
| Base | lb. | 1.03 | - | 1.06 |
| Tuads, Ethyl | lb. | — | - | 1.04 |
| Tuads, Methyl | lb. | — | - | 1.14 |
| Tuex | lb. | — | - | 1.14 |
| Ultex | lb. | 1.00 | - | 1.10 |
| Unads | lb. | — | - | 1.14 |
| Vulcacure NB | lb. | — | - | .45 |
| ZB | lb. | — | - | .85 |
| ZE | lb. | — | - | .85 |
| ZM | lb. | — | - | .85 |
| Z-B-X | lb. | — | - | 2.45 |
| Zenite | lb. | .48 | - | .50 |
| A | lb. | .57 | - | .59 |
| Zenite Special | lb. | .49 | - | .51 |
| Zetax (uncoated) | lb. | .49 | - | .51 |
| Zimate, Butyl | lb. | — | - | 1.04 |
| Zimate, Ethyl | lb. | — | - | 1.04 |
| Zimate, Methyl | lb. | — | - | 1.04 |

### ACTIVATORS

| | | | | |
|---|---|---|---|---|
| Blue Lead Sublimed (dlvd.) | lb. | .14¾ | - | .15¾ |
| Fish Oil, Hydrogenated, Fatty Acid | | | | |
| DAR-S (dlvd.) | lb. | .10¾ | - | .12½ |
| DAR-HY (dlvd.) | lb. | .13½ | - | .15¼ |
| Hydrofol Acids (dlvd.) | lb. | .13¼ | - | .17 |
| Hyfac 430 (dlvd.) | lb. | .15½ | - | .17¾ |
| Neo-Fat H.F.O. (dlvd.) | lb. | .14½ | - | .15¾ |
| Neutrax (dlvd.) | lb. | .14¼ | - | .16 |
| Stearex Beads (dlvd.) | lb. | .09¾ | - | .10¼ |
| Talene (dlvd.) | lb. | .13½ | - | .15¼ |
| Lime, Hydrated | | | | |
| Arrowhead | ton | — | - | 20.50 |
| Marblehead | ton | — | - | 16.00 |
| Sierra | ton | — | - | 22.00 |
| Litharge | | | | |
| Eagle-Picher | lb. | — | - | .15¾ |
| SB (dlvd.) | lb. | — | - | .15 |
| Magnesium Oxide, Heavy | | | | |
| General Magnesite 500 | lb. | .05 | - | .06½ |
| 600 | lb. | .06 | - | .08 |
| Michigan No. 15 | lb. | .06 | - | .06½ |
| Permanente | lb. | .05 | - | .06½ |
| Magnesium Oxide, Light | | | | |
| Baker's (Neoprene Grade) | lb. | — | - | .31 |
| General Magnesite (Neoprene Grade) | lb. | — | - | .30 |
| General Magnesite No. 101 | lb. | .21½ | - | .22½ |
| Genmag ML | lb. | — | - | .25 |
| 195 | lb. | — | - | .20½ |
| K & M (Neoprene Grade) | lb. | .30 | - | .31 |

### ACTIVATORS (Cont'd)

Magnesium Oxide, Light (cont'd)

| | | | | |
|---|---|---|---|---|
| Maglite D | lb. | — | - | .25 |
| M | lb. | — | - | .31 |
| Marine's (Neoprene Grade) (l.c.l.) | lb. | — | - | .30 |
| Michigan No. 30 | lb. | — | - | .25 |
| No. 40 Extra Light | lb. | — | - | .31 |
| Witco Extra Light | lb. | .32 | - | .35 |
| Oleic Acid | | | | |
| Emersol 210 (dlvd.) | lb. | .16 | - | .17¼ |
| L.C.P. Red Oil | lb. | .16 | - | .17¾ |
| Neo-Fat 90-14 | lb. | — | - | .14 |
| 92-04 | lb. | .16¾ | - | .18½ |
| Palm Oil Fatty Acid (c.l.) | lb. | .10½ | - | .14 |
| Potassium Oleate (dms.) | lb. | .45 | - | .55 |
| Red Lead | | | | |
| Eagle-Picher | lb. | — | - | .17 |
| No. 2 RM (dlvd.) | lb. | — | - | .17 |
| Sodium Laurate, 75% | lb. | .64 | - | .74 |
| Sodium Oleate, 75% | lb. | .45 | - | .55 |
| Paste (dms.) | lb. | — | - | .20 |
| Sodium Stearate, 75% | lb. | .45 | - | .55 |
| USP Grade (drums) | lb. | — | - | .37 |
| Stearic Acid, Single Pressed | | | | |
| Emersol 110 (dlvd.) | lb. | .13¾ | - | .15½ |
| Groco 53 | lb. | .13¼ | - | .15½ |
| Neo-Fat 18-53 | lb. | .13 | - | .13¾ |
| Standard Pearlstearic (dlvd.) | lb. | .13¾ | - | .15½ |
| Wochem 730 | lb. | .10 | - | .10¾ |
| Stearex B (dlvd.) | lb. | .15½ | - | .16¼ |
| Stearic Acid, Double Pressed | | | | |
| Choice Pearlstearic (dlvd.) | lb. | .14¼ | - | .16 |
| Emersol 120 (dlvd.) | lb. | .14¾ | - | .16 |
| Groco 54 | lb. | .14¼ | - | .16 |
| Neo-Fat 18-54 | lb. | .13½ | - | .14½ |
| Wochem 731 | lb. | .12¾ | - | .13½ |
| Stearic Acid, Other | | | | |
| Extra Pearlstearic (dlvd.) | lb. | .16½ | - | .18¼ |
| Neo-Fat 1-58 | lb. | .1190 | - | .1315 |
| 1-60 | lb. | .1400 | - | .1525 |
| 1-65 | lb. | .1450 | - | .1575 |
| Wochem 732 | lb. | .15 | - | .15¼ |
| White Lead Basic Carbonate | lb. | .16½ | - | .17½ |
| White Lead Basic Sulfate | lb. | .14¾ | - | .15¾ |
| Zinc Laurate | | | | |
| Laurex | lb. | .32 | - | .33 |
| Zinc Stearate | lb. | .39 | - | .42 |
| Aquazinc | lb. | .26 | - | .35 |

### Unclassified Activators

| | | | | |
|---|---|---|---|---|
| Actifat (dms.) | lb. | — | - | .18 |
| Actogen | lb. | — | - | .62 |
| Aktone | lb. | .22 | - | .23 |
| Barak | lb. | — | - | .62 |
| Curade | lb. | .57 | - | .59 |
| D-B-A | lb. | — | - | 1.95 |
| Dibutylamine (dlvd.) | lb. | .55 | - | .56 |
| MODX | tons | .32½ | - | .34½ |
| Ridacto (drums) | lb. | .25 | - | .26 |
| Snodette (dlvd.) | lb. | .17¾ | - | .19½ |
| Vulkior | lb. | .75 | - | .85 |

### ANTI-COAGULANTS

| | | | | |
|---|---|---|---|---|
| Anhydrous Ammonia (l.c.l.) | lb. | .17 | - | .21 |
| Aqua Ammonia (dms.) | lb. | .031 | - | .035 |
| M.B.M. (l.c.l.) | lb. | — | - | .35 |

### ANTI-FOAMING AGENTS

| | | | | |
|---|---|---|---|---|
| Aero Anti Foam H | lb. | — | - | .20 |
| Regular | lb. | — | - | .12 |
| D.C. Antifoam A | lb. | 5.45 | - | 6.65 |
| Antifoam A Emulsion | lb. | 2.05 | - | 4.00 |
| Antifoam AF Emulsion | lb. | 2.05 | - | 2.85 |
| Defoama W-1701 | lb. | — | - | .12½ |
| Defoamer A-25 | lb. | — | - | 3.00 |
| Defoamer 630 | lb. | — | - | .12½ |
| Deltyl Prime | lb. | .70 | - | .80 |
| Emcol IM | lb. | — | - | .60 |
| Kessco X-3 (dms.) | lb. | — | - | .35½ |
| Nopco 1407 | lb. | .20 | - | .20½ |
| 1497-V | lb. | .13¾ | - | .14¼ |
| 1907-B | lb. | .18¾ | - | .19¼ |
| JMK | lb. | .48½ | - | .49 |
| RS-968 | lb. | .38 | - | .38½ |
| SS-24 Silicone Anti-Foam | lb. | 5.80 | - | 6.90 |
| 66 | lb. | 5.70 | - | 6.20 |
| Terpinol Prime No. 1 | lb. | .35 | - | .50 |

### ANTIOXIDANTS

| | | | | |
|---|---|---|---|---|
| Agebest 1293-22A | lb. | 1.90 | - | 2.00 |
| Agerite Alba | lb. | 2.35 | - | 2.45 |
| Gel | lb. | .64 | - | .66 |
| Hipar | lb. | .98 | - | 1.00 |
| H. P. | lb. | .72 | - | .74 |

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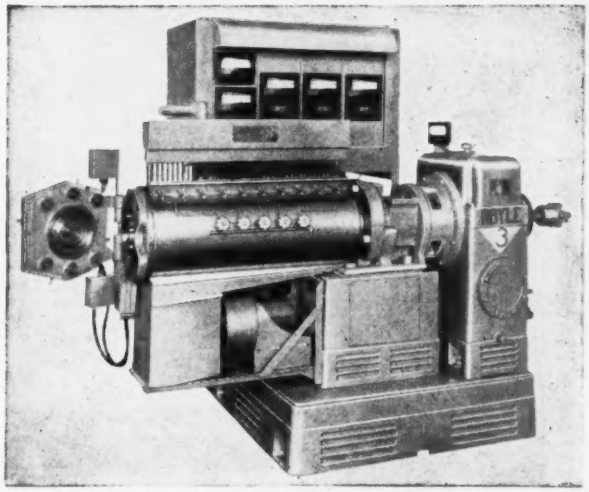

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- **Any heating element may be removed and replaced without disturbing other elements or wiring.**
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PATERSON 3, NEW JERSEY

### ANTIOXIDANTS (Cont'd)

| | | | |
|---|---|---|---|
| Agerite Alba Powder | lb. | .52 | .54 |
| Resin | lb. | .75 | .77 |
| Resin D | lb. | .52 | .54 |
| Stalite | lb. | .52 | .54 |
| White | lb. | 1.45 | 1.55 |
| Akroflex C | lb. | .77 | .79 |
| CD | lb. | .72 | .74 |
| Aminox | lb. | .52 | .54 |
| Antioxidant 2246 | lb. | 1.65 | 1.68 |
| Antox | lb. | .52 | .54 |
| Aranox | lb. | — | 3.25 |
| Benzoquinone | lb. | 1.50 | 1.75 |
| Betanox Special | lb. | .80 | .82 |
| B-L-E | lb. | .52 | .54 |
| B-X-A | lb. | .52 | .54 |
| Deenax | lb. | .95 | 1.05 |
| Di-tert-Butyl-para-Cresol | lb. | .91 | .95 |
| Eugenol C-95% | lb. | 2.30 | 2.50 |
| Flectol H | lb. | .52 | .59 |
| Flexamine | lb. | .72 | .74 |
| Neozone A | lb. | .56 | .58 |
| C | lb. | — | .80 |
| D | lb. | .52 | .54 |
| Octamine | lb. | .52 | .54 |
| Oxidex | lb. | — | 3.60 |
| PDA-10 | lb. | .39 | .41 |
| Permalux | lb. | — | 2.17 |
| Polygard | lb. | .52 | .54 |
| Santoflex AW | lb. | .78 | .85 |
| B | lb. | .52 | .59 |
| BX | lb. | .63 | .70 |
| 35 | lb. | .72 | .79 |
| Santovar-A | lb. | 1.50 | 1.57 |
| Santowhite Crystals | lb. | 1.60 | 1.67 |
| Santowhite L | lb. | .52 | .59 |
| MK | lb. | 1.29 | 1.36 |
| Santowhite Powder | lb. | 1.60 | 1.67 |
| Sequestrene AA | lb. | — | .97½ |
| NA2 | lb. | — | .79½ |
| NA3 | lb. | — | .77½ |
| Stabilite | lb. | .55 | .57 |
| Alba | lb. | .72 | .77 |
| L | lb. | .60 | .62 |
| White | lb. | .53 | .55 |
| White Powder | lb. | .41 | .43 |
| Stabilizer No. 1 | lb. | 1.55 | 1.80 |
| Stabilizer No. 9-A | lb. | .80 | 1.05 |
| Styphen I | lb. | .51 | .55 |
| Sunolite | lb. | .21 | .23 |
| Tannic Acid, Tech. | lb. | .46 | .48 |
| Thermoflex A | lb. | .98 | 1.00 |
| V-G-B | lb. | .70 | .72 |
| Wing-Stay S | lb. | .51 | .52 |

### ANTI-SCORCHING AGENTS

| | | | |
|---|---|---|---|
| Armeen HT | lb. | .31 | .33 |
| Benzoic Acid—Tech. | lb. | — | .43 |
| Good-rite Vultrol | lb. | .62 | .64 |
| Harcopol 1183 | lb. | .70 | .74 |
| Sodium Acetate 60-62% Crystals | lb. | .08 | .08½ |

### ANTISEPTICS AND GERMICIDES

| | | | |
|---|---|---|---|
| Arquad S | lb. | .24 | .26 |
| Formaldehyde (dms.) | lb. | .066 | .071 |
| G-4 (bbls.) | lb. | 1.04 | 1.19 |
| G-11 | lb. | 2.20 | 2.30 |
| Nuodex 100 S.S. (dlvd.) | lb. | — | 1.10 |
| Nuodex 100 W.D. (dlvd.) | lb. | — | 1.25 |
| Nuodex Zinc 8% (dms.) (dlvd.) | lb. | .24 | .28 |
| Ortho Cresol (26°-27°) | lb. | — | .201 |
| Preventol GD | lb. | — | 1.04 |
| I | lb. | — | .80 |
| Retarder D | lb. | .42 | .50 |
| Soligen Drier—Copper 8% (dms.) | lb. | .20¼ | .21½ |
| Zinc 8% (dms.) | lb. | .22¼ | .23½ |
| Vancide | lb. | — | .80 |

### ANTI-WEBBING AGENTS (for Latex)

| | | | |
|---|---|---|---|
| DC 7 Compound | lb. | 5.13 | 6.50 |
| Webnix 34 | lb. | 1.50 | 2.25 |

### AROMATICS (DEODORANTS)

| | | | |
|---|---|---|---|
| Airkem 115 | gal. | — | 6.50 |
| 122 | gal. | — | 6.50 |
| 186 | gal. | — | 6.50 |
| Alamask AA | lb. | — | 3.00 |
| AF | lb. | — | 2.50 |
| AO | lb. | — | 1.50 |
| AR | lb. | — | .50 |
| BG | lb. | — | 1.15 |
| BGM | lb. | — | .60 |
| CY | lb. | — | 2.40 |
| DJ | lb. | — | 3.35 |
| DL | lb. | — | 1.95 |
| H | lb. | — | 5.50 |
| LD | lb. | — | .75 |
| ND | lb. | — | 2.75 |
| O | lb. | — | 6.50 |
| OS | lb. | — | 5.25 |
| Bouquet 149 | lb. | — | 3.00 |
| Coumarin | lb. | 2.95 | 3.00 |
| Curodex 19 | lb. | 4.75 | 4.90 |
| 188 | lb. | 5.75 | 5.90 |
| 198 | lb. | 6.75 | 6.90 |
| Deodorant 65 | lb. | — | 1.85 |

### AROMATICS (Cont'd)

| | | | |
|---|---|---|---|
| Deodorant L-37 | lb. | 2.00 | 2.40 |
| L-44 | lb. | 2.50 | 2.90 |
| N.L.T.X. | lb. | 1.85 | 2.15 |
| Deodorant Oil GD 3427 | lb. | 1.70 | 2.00 |
| GD 6422 | lb. | 2.00 | 2.50 |
| GD 6423 | lb. | 1.60 | 1.90 |
| GD 6575 | lb. | 2.40 | 2.90 |
| GD 31063 | lb. | 2.25 | 2.75 |
| Latex Perfume 5 | lb. | — | 3.25 |
| 6 | lb. | — | 7.50 |
| 9 | lb. | — | .65 |
| Naugaromes (dms.) | lb. | .60 | 3.00 |
| Neutroleum Delta | lb. | — | 2.60 |
| Gamma | lb. | — | 3.60 |
| Parador A | lb. | 2.00 | 2.50 |
| C | lb. | 2.75 | 3.25 |
| E | lb. | .25 | .55 |
| GD 5280 | lb. | 2.00 | 2.50 |
| GD 5348 | lb. | 1.90 | 3.25 |
| Perfume Oil Bouquet Vanilla M | lb. | 2.40 | 2.75 |
| Rodo No. 0 | lb. | 4.00 | 4.50 |
| No. 10 | lb. | 5.00 | 5.50 |
| Rubbarome (dms.) | lb. | .60 | 3.80 |
| Rubber Perfume 12 | lb. | — | 2.85 |
| Russian Leather 7 | lb. | — | 4.35 |
| Vanillin | lb. | 3.00 | 3.25 |

### BLOWING AGENTS

| | | | |
|---|---|---|---|
| Ammonium Bicarbonate | cwt. | — | 8.00 |
| Blowing Agent CP-975 | lb. | .32 | .35 |
| Celogen | lb. | — | 1.95 |
| AZ | lb. | 1.94 | 1.95 |
| Sodium Bicarbonate, U.S.P. (c.l., bags) | cwt. | — | 2.30 |
| Sponge Paste | lb. | — | .20 |
| Unicel | lb. | — | .90 |
| ND | lb. | — | .76 |
| S | lb. | — | .20 |
| Urea | lb. | .04¼ | .04¾ |

### BONDING AGENTS

| | | | |
|---|---|---|---|
| Braze | gal. | 6.00 | 9.00 |
| Cover Cement | gal. | 2.50 | 4.00 |
| Durez 12987 | lb. | — | .54 |
| Kalabond | gal. | 6.50 | 7.75 |
| MDI (dms.) | lb. | 3.45 | 3.75 |
| 50 (dms.) | lb. | 1.85 | 2.15 |
| Penacolite B1A | lb. | — | .95 |
| R-2710 | lb. | — | .95 |
| Pliobond 20 | gal. | 2.91 | 4.23 |
| 30 | gal. | 3.65 | 4.97 |
| Rex Compounds | gal. | 1.30 | 2.85 |
| TDI (dms.) | lb. | 2.00 | 2.30 |
| Thixons | gal. | 3.30 | 9.00 |
| Ty-Ply Q (BN & S) | gal. | 6.75 | 8.00 |
| Tygobond 30 | gal. | 5.50 | 7.45 |

### COAGULANTS

| | | | |
|---|---|---|---|
| Acetic Acid—56% (bbls.) | cwt. | 9.00 | 11.00 |
| Glacial 99½% (dms.) | lb. | .12 | .13 |
| Calcium Nitrate, Tech. Crystals | lb. | .07 | .11½ |
| Hydroxyacetic Acid—70% (dms.) | lb. | — | .084 |
| Zinc Nitrate, Tech. | lb. | — | .22½ |

### COLORING AGENTS

#### Black

| | | | |
|---|---|---|---|
| Aquablak B (also M, R) | lb. | .08½ | .11¼ |
| Aquablak S | lb. | .11½ | .12 |
| Black Shield 4-35 (dms.) | lb. | — | .09 |
| Carbon Black—See *Reinforcing Agents* | | | |
| Lampblack No. 10 | lb. | .06 | .09 |
| Mapico Black Iron Oxide (50 lb. bags) | lb. | .12¾ | .13 |
| Pure Black Iron Oxide | cwt. | 12.75 | 13.00 |

#### Blue

| | | | |
|---|---|---|---|
| Cooke M.B. Blue | lb. | 2.45 | 2.85 |
| Milori Blue | lb. | — | .48 |
| Monastral Rubber Blue CPL | lb. | — | 1.77 |
| PCD, Dispersed | lb. | — | 2.20 |
| Peacoline Blue | lb. | — | 3.85 |
| Ramapo Blue | lb. | — | 3.00 |
| Rubber Blue GD | lb. | — | 4.55 |
| Rubber Blue X-1999 | lb. | — | 1.70 |
| Syntheline Blue | lb. | — | 3.85 |
| Stan-Tone MBS | lb. | 1.55 | 4.55 |
| GPE | lb. | — | 2.50 |
| PC | lb. | — | 2.40 |
| PDS | lb. | — | 2.00 |
| PVC | lb. | — | 3.25 |
| Ultramarine | lb. | .14 | .30 |
| Vansul Blue M.B. | lb. | .90 | 2.60 |

#### Brown

| | | | |
|---|---|---|---|
| Brown Iron Oxide | lb. | .13¾ | .14 |
| Mapico Brown (50 lb. bags) | lb. | .13¾ | .14 |
| Stan-Tone GPE | lb. | — | 3.00 |
| Vansul Brown M.B. (Organic) | lb. | — | 2.10 |

### COLORING AGENTS (Cont'd)

#### Green

| | | | |
|---|---|---|---|
| Cooke M.B. Green | lb. | 1.45 | 3.20 |
| Filo Green | lb. | — | .32 |
| Green Chromium Oxide, Pure | lb. | — | .39¾ |
| Green Chromium Oxide, Pure Hydrated | lb. | — | 1.10 |
| Monastral Rubber Green GSD (Dispersed) | lb. | — | 2.80 |
| GSL | lb. | — | 1.97 |
| Permansa Green CP-594 | lb. | — | 1.35 |
| Pigment Green B | lb. | — | 1.35 |
| GL-652D | lb. | .80 | .85 |
| Ramapo Green | lb. | — | 3.50 |
| Rubber Green FD (disp.) | lb. | — | 2.05 |
| Rubber Green X-1292 | lb. | — | 1.30 |
| Stan-Tone MBS | lb. | 1.75 | 3.60 |
| GPE | lb. | — | 3.00 |
| PC | lb. | — | 3.00 |
| PDS | lb. | 1.90 | 2.20 |
| PVC | lb. | — | 3.60 |
| Vansul Green M.B. | lb. | 1.00 | 3.05 |

#### Maroon

| | | | |
|---|---|---|---|
| Stan-Tone MBS | lb. | — | 3.50 |
| Vansul Maroon M.B. | lb. | — | 3.25 |

#### Orange

| | | | |
|---|---|---|---|
| Molybdate Orange | lb. | — | .44 |
| Rubber Orange (disp.) | lb. | — | 2.75 |
| Rubber Orange X-2065 | lb. | — | 3.00 |
| Stan-Tone GPE | lb. | — | 1.20 |
| PC | lb. | — | 1.05 |
| PDS | lb. | — | 1.20 |
| PVC | lb. | — | 2.25 |
| Vansul Orange M.B. | lb. | 2.00 | 2.50 |

#### Red

| | | | |
|---|---|---|---|
| Antimony Trisulfide | lb. | .72 | .78 |
| R. M. P. Sulfur Free | lb. | — | .78 |
| R. M. P. No. 3 | lb. | — | .72 |
| Cadmium Red | lb. | .95 | 1.25 |
| Cadmolith Red (bbls.) | lb. | 1.75 | 2.00 |
| Cooke M.B. Red | lb. | .95 | 3.15 |
| Graphic Red (dlvd.) | lb. | — | .79 |
| Indian Red, American, Pure | lb. | .12¾ | .13 |
| Doxco (English) | lb. | .11½ | .11¾ |
| Kroma Reds | lb. | .16¼ | .21¼ |
| Mapico Reds (50 lb. bags) | lb. | .12¾ | .13 |
| Oximony Iron Oxide | lb. | — | .09 |
| Recco Red Oxide | lb. | .12 | .13 |
| Red Iron Oxide, Light | lb. | .13 | .13½ |
| Rubber Red PBD (disp.) | lb. | — | 1.75 |
| 2BD, Dispersed | lb. | — | 1.80 |
| 2BL | lb. | — | 1.47 |
| PBL | lb. | — | 1.65 |
| Rubanox Red CP-762 (dlvd.) | lb. | — | 1.40 |
| Rubber Red CP-339 (dlvd.) | lb. | — | 1.10 |
| Rubber Red X-1148 | lb. | — | .79 |
| Solfast Red | lb. | 1.50 | 1.95 |
| Stan-Tone MBS | lb. | 1.20 | 4.00 |
| GPE | lb. | 1.65 | 2.00 |
| PC | lb. | 1.45 | 2.40 |
| PDS | lb. | 1.40 | 1.55 |
| PVC | lb. | — | 2.00 |
| Sun Burnt Red | lb. | .11½ | .11¾ |
| Vansul Red M.B. | lb. | 1.20 | 3.20 |
| Watchung Red | lb. | 1.63 | 1.95 |

#### White—Lithopone

| | | | |
|---|---|---|---|
| Albalith | lb. | .0750 | .0850 |
| Eagle-Picher | lb. | .0750 | .0825 |
| Permolith | lb. | .0750 | .0825 |
| Sunolith | lb. | .0750 | .0825 |

#### White—Titanium Pigments

| | | | |
|---|---|---|---|
| Ti-Cal | lb. | .08⅜ | .09⅛ |
| R-25, R-22, R-27, R-30 | lb. | .08⅜ | .08⅞ |
| R-60 | lb. | .08⅝ | .09⅛ |
| Ti-Pure | lb. | .22½ | .25½ |
| Anatase grades | lb. | .22½ | .23½ |
| Rutile grades | lb. | .24½ | .25½ |
| Titanox A—all grades (dlvd.) | lb. | .22½ | .23½ |
| C-50 (dlvd.) | lb. | .12⅞ | .13⅜ |
| RA (dlvd.) | lb. | .24½ | .25½ |
| RA-10 (dlvd.) | lb | .24½ | .25½ |
| RA-NC (dlvd.) | lb. | .24½ | .25½ |
| RC (dlvd.) | lb. | .08⅝ | .09⅛ |
| RC-HT (dlvd.) | lb. | .08⅜ | .08⅞ |
| Unitane O-220 | lb. | .19½ | .20½ |
| OR-250 | lb. | .21½ | .22½ |
| Zopaque | lb. | .22½ | .23½ |
| R | lb. | .24½ | .25½ |

*Now . . . Up-To-The-Minute*

# INTERNATIONAL TECHNICAL ASSISTANCE

- To tire and other rubber manufacturers abroad, who desire to learn the latest American "Know-How" . . . cut manufacturing costs—we offer comprehensive Technical Assistance at low cost.
- Dayton Rubber's I.T.A. plan has been in existence for 20 years. Rubber experts and teachers that give unexcelled technical assistance at a surprisingly nominal cost . . . all backed by 48 years of recognized leadership in the rubber industry . . . with 4 U. S. plants.
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*Write: International Technical Assistance Division*

I.T.A. INTERNATIONAL TECHNICAL ASSISTANCE DIVISION THE DAYTON RUBBER CO. DAYTON, OHIO

**Dayton Rubber**

Dayton 1, Ohio, U. S. A.
Cable Address: Thorobred

SINCE 1905, MANUFACTURERS OF TIRES AND TUBES

For NEOPRENE COMPOUNDING

**MAGLITE-M***

- Better acid acceptance
- Better anti-scorch properties
- Better uncured stock life
- Safer tubing at higher die termperatures
- Faster tubing and wire coverlng
- Better molding characteristics
- Excellent curing aid

**MAGLITE-D***

*Has all the advantages of MAGLITE-M with these added characteristics*

- Greater bulking factor per cubic foot
- Higher magnesium oxide content
- Easier incorporation into neoprene
- Less dust

*Magnesium oxides produced by Marine Magnesium Corporation from sea water by patented processes

*Call on Whittaker*
"The Talc House"

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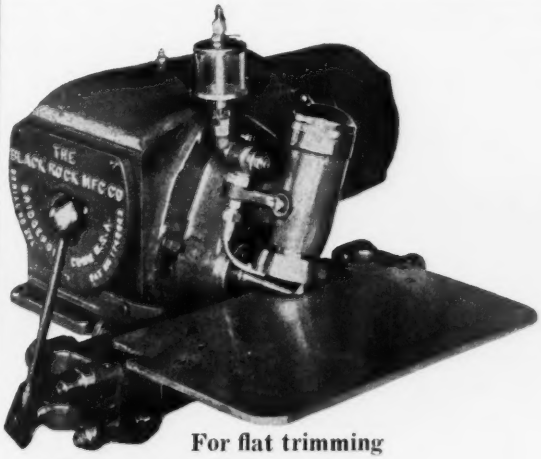
PUMICE
ELK BRAND ANTIMONY OXIDE

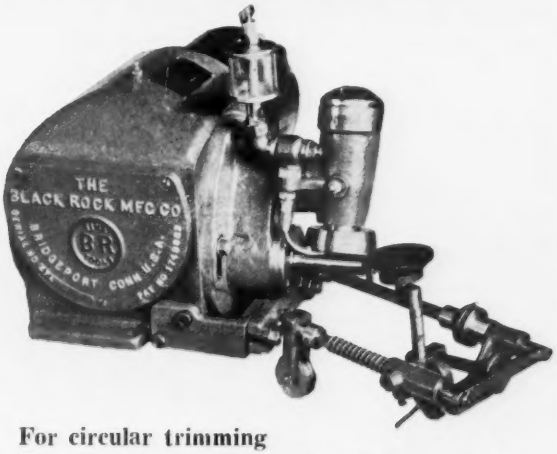
WHITTAKER CLARK & DANIELS, INC.
260 West Broadway
New York 13, N. Y.

**IMPROVE YOUR TRIMMING PRODUCTION**
**. . . With a BLACK ROCK 4TA**




**For flat trimming**

- Cutters are self-sharpening
- Mechanism completely enclosed.
- Unit driven by an integral 1/6 H.P. Motor.
- Ball bearing mounted.




**For circular trimming**

The Black Rock 4TA Rubber Trimmer is the most compact, sturdy . . . yet flexible machine made. Designed for accurate and rapid work, it trims flat as well as circular pieces and possesses many exclusive features.

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FINE BR TOOLS

BLACK ROCK MFG. CO.
175 Osborne Street Bridgeport 5, Conn.
N. Y. Office, 261 Broadway

## COLORING AGENTS (Cont'd)

### White—Zinc Oxide (American Process)

| | | | |
|---|---|---|---|
| AZO-ZZZ 11 (and 22, 33, 44, 55) | lb. | .1350 | .1450 |
| Eagle Picher AAA | lb. | .1350 | .1450 |
| Horse Head Special | lb. | .1350 | .1450 |
| XX | lb. | .1350 | .1450 |
| Protox 166 | lb. | .1350 | .1450 |
| 167 | lb. | .1350 | .1450 |
| St. Joe Black Label | lb. | .1350 | .1450 |
| Green Label | lb. | .1350 | .1450 |
| Red Label | lb. | .1350 | .1450 |

### White—Zinc Oxide (Dispersed)

| | | | |
|---|---|---|---|
| Dispersed Zinc Oxide | lb. | — | .13 |

### White—Zinc Oxide (French Process)

| | | | |
|---|---|---|---|
| Florence Green Seal | lb. | .1525 | .1625 |
| Red Seal | lb. | .1475 | .1575 |
| White Seal | lb. | .1575 | .1675 |
| Kadox 25 | lb. | .1575 | .1675 |
| Kadox 15, 17 and 72 | lb. | .1450 | .1450 |
| Protox 168 | lb. | .1350 | .1450 |
| 169 | lb. | .1350 | .1450 |
| U.S.P. (cartons) | lb. | .1675 | .1775 |

### White—Zinc Sulfide

| | | | |
|---|---|---|---|
| Cryptone ZS | lb. | .2530 | .2630 |

### Yellow

| | | | |
|---|---|---|---|
| Benzidine Yellow | lb. | 2.50 | 3.50 |
| Cadmolith Yellow (bbls.) | lb. | — | 1.15 |
| Chrome Yellow | lb. | — | .31 |
| Cooke M.B. Yellow 405 | lb. | — | 1.70 |
| Iron Oxide, Pure | lb. | .10¼ | .10¾ |
| **Mapico Yellow (50 lb. bags)** | lb. | .10½ | .10¾ |
| Rubber Yellow GD (disp.) | lb. | — | 2.15 |
| GL | lb. | — | 1.80 |
| Rubber Yellow X-1940 | lb. | — | 2.15 |
| Stan-Tone MBS | lb. | 1.30 | 4.50 |
| GPE | lb. | — | 4.50 |
| PC | lb. | .85 | 4.50 |
| PDS | lb. | 1.25 | 1.75 |
| PVC | lb. | — | 1.60 |
| Toluidine Yellow YL-660 D | lb. | 1.15 | 1.20 |
| **Oximony Iron Oxide** | lb. | — | .06¾ |
| Vansul Yellow M.B. | lb. | .95 | 1.95 |
| Zinc Yellow | lb. | .25 | .30 |

## DISPERSING AGENTS

| | | | |
|---|---|---|---|
| **Anchoid*** | lb. | .24 | .25 |
| Armeen 18 | lb. | .38 | .40 |
| Blancol | lb. | — | .15¾ |
| Darvan No. 1 (and No. 2) | lb. | .22 | .30 |
| Daxad 11 (21, 23) | lb. | .08 | .30 |
| Diethanalomine (dms., dlvd.) | lb. | .27½ | .30¼ |
| **Dispersaid** | lb. | 1.25 | 1.35 |
| Emcol K-8300 (dms.) | lb. | .19 | .20 |
| Emulphor ON-870 | lb. | — | .61 |
| **Furala** | lb. | .06½ | .07½ |
| **Halloid** | lb. | .04½ | .05½ |
| Igepal CO-630 | lb. | — | .36 |
| Igepon T-73 | lb. | — | .29½ |
| Leonil SA | lb. | — | .55 |
| Lomar PW | lb. | — | .16 |
| Marasperse C | lb. | .06½ | .06¾ |
| CB | lb. | .12¼ | .13¼ |
| N | lb. | .09½ | .10½ |
| Monoethanalomine (dms., dlvd.) | lb. | .28 | .30¾ |
| Nekal BA-75 | lb. | — | .40 |
| BX-76 | lb. | — | .64 |
| Nopco 1187-X | lb. | .15½ | .16⅜ |
| **Rubbex** | lb. | .267 | .285 |
| Stablex B | lb. | .50 | .95 |
| **Stan-Chem BQC** | lb. | .12¼ | .17¼ |
| **1067** | lb. | — | .13½ |
| **1471** | lb. | .1687 | .2187 |
| **2251** | lb. | .12¼ | .17¼ |
| Trenamine D-25 | lb. | .32½ | .36 |
| **Triethanolamine (drums)** (dlvd.) | lb. | .24½ | .27¼ |
| Yelkin TT | lb. | .13 | .17 |
| **Zinsper** | lb. | — | .15 |

## EXTENDERS

| | | | |
|---|---|---|---|
| **Advagum 1098** | lb. | — | .64 |
| Arcco 1071-13B | lb. | .14½ | .15½ |
| 1073-18B | lb. | .13½ | .14½ |
| 1294-36B | lb. | .11½ | .12½ |
| **Bunaweld Polymer No. 780** | lb. | — | .22 |
| **No. 5514** | lb. | — | .35 |
| Car-Bel-Ex-A and B | lb. | — | .14 |
| Extender 600 | lb. | — | .1765 |
| Millex | lb. | — | .07 |
| W | lb. | — | .07 |
| Nopco 2271 | lb. | .15½ | .16½ |
| Polyco 418 | lb. | .17 | .18 |
| **PR-163 Latex Extender** | gal. | — | 1.55 |
| **Synprolac** | lb. | .16 | .23 |
| **Synprowax** | lb. | — | .23 |
| **Vistanex** | lb. | — | .45 |

## FILLERS (Inert and Reinforcing)

| | | | |
|---|---|---|---|
| **Abrasives** | | | |
| Carbonite | lb. | .20 | 1.33 |
| Lionite | lb. | .14½ | 1.25 |
| **Pumice** | lb. | .03 | .05 |
| **Aluminum Hydrate** | lb. | .07 | .10 |
| **Aluminum Silicate** | | | |
| Aluminum Flake | ton | 23.50 | 30.00 |
| **Marter White** | ton | 18.50 | 30.00 |
| Barium Carbonate (l.c.l.) | ton | 95.50 | 100.00 |
| **Barytes** | | | |
| No. 1 Floated, White | ton | 41.35 | 60.10 |
| **No. 2 Floated, Unbleached** | ton | 39.35 | 58.10 |
| No. 22 Barytes (c.l.) | ton | — | 25.00 |
| No. 3805 Barytes | ton | 21.25 | 26.75 |
| Foam A | ton | — | 41.35 |
| XIOR | ton | 75.00 | 80.00 |
| Bentonite (c.l.) | ton | — | 13.50 |
| Argosite Clay (c.l.) | ton | — | 12.50 |
| Bennett Clay (c.l.) | ton | — | 32.50 |
| SPV Volclay (c.l.) | ton | — | 12.50 |
| White Hi-Gel | ton | — | 65.90 |
| **Blanc Fixe** | ton | 72.50 | 120.00 |
| **Calcium Carbonate** | | | |
| **Atomite (c.l.)** | ton | — | 30.00 |
| B.I. White No. 1 (c.l.) | ton | — | 8.00 |
| B.I. White No. 2 (c.l.) | ton | — | 7.50 |
| B.I. White No. 390 | ton | — | 6.25 |
| Blue Star XX | ton | — | 15.50 |
| Calcene NC | ton | 72.50 | 92.50 |
| TM | ton | 75.00 | 95.00 |
| Calwhite | ton | — | 17.00 |
| Camel-Carb | ton | — | 10.00 |
| Camel-Tex | ton | — | 18.00 |
| Camel-Wite | ton | — | 30.00 |
| Duramite | ton | — | 15.00 |
| **Gamaco** | ton | — | 30.00 |
| Kalite | ton | 50.00 | 65.00 |
| Keystone White | ton | — | 16.00 |
| **Laminar** | ton | — | 30.00 |
| **Lesamite (c.l.)** | ton | — | 27.50 |
| Lorite | ton | 30.00 | 35.00 |
| Millical | ton | 35.00 | 50.00 |
| Multifex | ton | 140.00 | 155.00 |
| MM | ton | 110.00 | 125.00 |
| Non-Fer-Al | ton | 30.00 | 45.00 |
| Purecal M | ton | 56.75 | 80.75 |
| SC | ton | 110.00 | 125.00 |
| T | ton | 110.00 | 125.00 |
| U | ton | 120.00 | 135.00 |
| Rambo No. 1 | ton | — | 8.50 |
| **Sierracal** | ton | 15.00 | 18.50 |
| Snowflake | ton | 17.00 | 18.00 |
| Super Multifex | ton | 160.00 | 175.00 |
| Surfex | ton | 35.00 | 50.00 |
| Suspenso | ton | 33.00 | 48.00 |
| Witcarb Reg. | ton | 56.75 | 80.75 |
| P | ton | 110.00 | 125.00 |
| R | ton | 120.00 | 135.00 |
| RC | ton | 110.00 | 125.00 |
| York White | ton | — | 9.50 |
| **Calcium Silicate** | | | |
| Silene EF | ton | 120.00 | 140.00 |
| **Calcium Sulfate, Anhydrous** | | | |
| Snow White Filler | ton | — | 20.50 |
| **Calcium Sulfate, Hydrous** | | | |
| **Terra Alba No. 1** | ton | 12.00 | 14.40 |
| **Chalk Whiting (l.c.l.)** | lb. | .0150 | .0175 |
| Recco Paris Whiting | ton | — | 33.00 |
| Clay | | | |
| Aiken Clay | ton | — | 14.00 |
| Alsilite (c.l.) | ton | 20.00 | 45.00 |
| Alsite (c.l.) | ton | — | 14.00 |
| Aluminum Flake | ton | 23.50 | 30.00 |
| Buca (c.l.) | ton | — | 45.00 |
| **Burgess No. 20** | ton | — | 35.00 |
| **No. 30** | ton | — | 37.00 |
| Burgess Iceberg | ton | — | 50.00 |
| **Catalpo (c.l.)** | ton | — | 35.00 |
| Champion | ton | — | 14.00 |
| **C.S.D. (c.l.)** | ton | — | 13.50 |
| Crown | ton | — | 14.00 |
| Dixie (c.l.) | ton | — | 14.00 |
| Franklin Clay (c.l.) | ton | — | 13.50 |
| Harwick Clays | ton | 18.50 | 57.00 |
| **Hi-White R** | ton | — | 13.50 |
| Kaolloid Clay (c.l.) | ton | — | 10.50 |
| LGB | ton | — | 17.00 |
| LGP | ton | — | 19.00 |
| McNamee (c.l.) | ton | — | 13.50 |
| **Paragon** | ton | — | 13.50 |
| Pigment 5 | ton | 23.50 | 26.50 |
| **Pigment 33** | ton | — | 37.00 |
| Recco (c.l.) | ton | — | 14.00 |
| Sewanee Clay | ton | — | 12.50 |
| Snobrite | ton | — | 12.50 |
| Suprex | ton | — | 14.00 |
| **Whitetex (c.l.)** | ton | — | 50.00 |
| Windsor Clay (c.l.) | ton | — | 14.00 |
| **Diatomaceous Earth** | ton | 30.00 | 50.00 |
| **Kaylorite (c.l.)** | ton | — | 30.00 |
| Lorite | ton | — | 30.00 |
| **Flock** | | | |
| Cotton, white and colored | lb. | .11 | .28 |
| Filfloc F 40-9000 | lb. | — | .13 |
| Filfloc F 6000 | lb. | — | .36 |
| Polycel | ton | 110.00 | 210.00 |
| Rayon, bleached or dyed | lb. | .82 | 1.25 |
| **Rayon, grey** | lb. | — | .18 |
| Rayon, pink | lb. | — | .18 |
| Solka-Floc (l.c.l.) | lb. | .07 | .16 |
| Glue, Bone (dlvd.) | lb. | .18 | .20½ |
| Leather, Shredded | lb. | .05 | .17 |
| Lignin | lb. | .03 | .06 |
| Indulin | lb. | .06 | .08 |

## FILLERS (Cont'd)

| | | | |
|---|---|---|---|
| Limestone, Pulverized | ton | 3.00 | 4.75 |
| Asbestol Superfine | ton | — | 30.00 |
| Georgia Marble No. 10 | ton | — | 10.00 |
| **Industrial Filler No. 100** | ton | — | 5.75 |
| Micro Velva A | ton | 49.00 | 51.00 |
| Micro Velva L | ton | 57.00 | 59.00 |
| Magnesium Carbonate | lb. | .0950 | .1050 |
| K & M Clearcarb | lb. | .1225 | .1275 |
| Magnesium Oxide | lb. | .05 | .06 |
| Magnesium Silicate (see Talc) | | | |
| **Mica** | lb. | .01¼ | .07¾ |
| Concord | lb. | .07½ | .08¼ |
| Micro-Mica | lb. | .07½ | .08¼ |
| Mineralite (c.l.) | ton | 30.00 | 85.00 |
| Silversheen | lb. | .07½ | .08¼ |
| **Triple A Mica (c.l.)** | ton | — | 25.00 |
| Vermiculite | lb. | — | .11 |
| **Wet Ground Biotite Mica** | lb. | .06 | .06¾ |
| **Wet Ground Mica No. 160** | lb. | .07½ | .08¼ |
| Pyrophyllite | | | |
| **No. 261** | ton | — | 11.50 |
| Pyrax A (c.l.) | ton | — | 13.50 |
| WA (c.l.) | ton | — | 16.00 |
| Sawdust, Graded | ton | 14.00 | 35.00 |
| **Silica** | ton | 16.00 | 27.00 |
| Blue Star | ton | — | 20.60 |
| **Slate, Powdered (l.c.l.)** | ton | 15.00 | 20.00 |
| Lo-Micron Slate Flour | lb. | — | .04½ |
| No. 133 Slate Flour | ton | — | 4.55 |
| Sodium Silico Aluminate Zeolex 23 | ton | 120.00 | 140.00 |
| Talc (Magnesium Silicate) | | | |
| Asbestol Regular | ton | — | 25.00 |
| Blue Star | ton | — | 23.00 |
| French | ton | — | 59.00 |
| L. S. Silver | ton | 29.25 | 34.25 |
| No. 367 | ton | — | 13.00 |
| No. 1600 | ton | — | 70.60 |
| No. 1768 | ton | — | 13.00 |
| Nytal 200 | ton | — | 25.00 |
| 300 | ton | — | 36.00 |
| Sierra White | ton | 25.75 | 30.75 |
| Soapstone | ton | — | 13.00 |
| Walnut Shell Flour | ton | 45.00 | 115.00 |
| Stan-Shell | ton | 63.00 | 126.00 |
| **Whiting, Commercial** | ton | — | 7.00 |
| Camel-Carb | ton | — | 10.00 |
| C-C-O White | ton | — | 19.00 |
| Georgia Marble No. 15 | ton | — | 15.00 |
| No. 16 | ton | — | 16.00 |
| **Keystone (c.l.)** | ton | — | 16.00 |
| Snowflake (c.l.) | ton | 17.00 | 18.00 |
| Stan-White 325 | ton | 8.50 | 11.16 |
| **Veroc (c.l.)** | ton | — | 8.50 |
| Welco (c.l.) | ton | — | 8.50 |
| York White R (c.l.) | ton | — | 8.50 |
| Wood Flour | ton | 25.50 | 48.00 |

## FINISHING MATERIALS, SURFACE

| | | | |
|---|---|---|---|
| Beaco Finishes | gal. | 2.10 | 2.35 |
| **Black Out** | gal. | 4.50 | 8.00 |
| Shellac, Orange Gum | lb. | .39 | .49 |
| VanWax | gal. | 1.45 | 1.50 |

## FLAME RETARDANTS

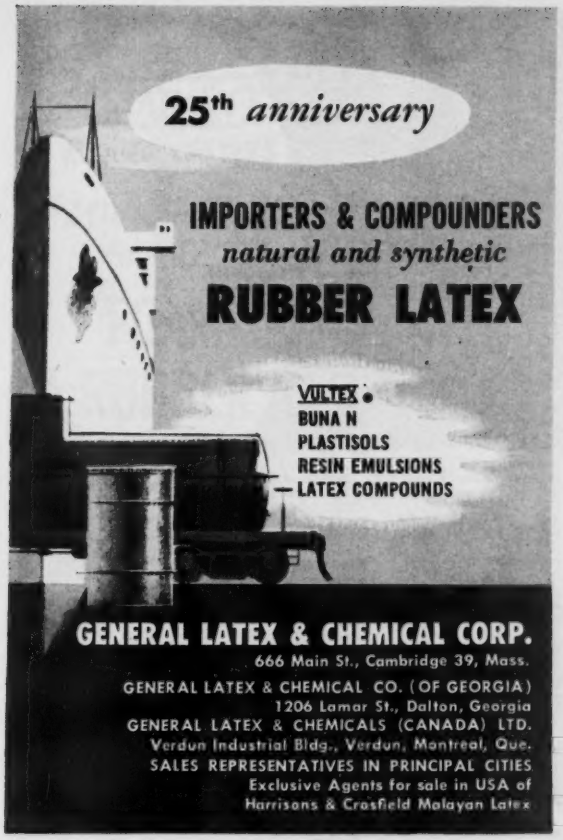
| | | | |
|---|---|---|---|
| Chlorowax 70 | lb. | .18 | .19 |
| Halowax | lb. | .35½ | .61½ |
| Zinc Borate 3167 | lb. | .1920 | .2020 |
| Zyrox | lb. | .76½ | .86½ |

## LATEX MODIFIERS

| | | | |
|---|---|---|---|
| OPD-101 | lb. | — | .26 |

## LUBRICANTS, MOLD

| | | | |
|---|---|---|---|
| Akro Gel | lb. | — | .165 |
| Alipal CO-433 | lb. | — | .21 |
| CO-436 | lb. | — | .27½ |
| **Aquadag** | lb. | 3.50 | 4.00 |
| Aquarex D | lb. | — | .78 |
| L | lb. | — | .94 |
| ME | lb. | — | .94 |
| MDL | lb. | — | .33 |
| WAQ | lb. | — | .25 |
| Armid O | lb. | .39 | .41 |
| Borax, Granular (l.c.l.) | ton | 89.00 | 94.00 |
| Carbowax 4000 | lb. | .31 | .32 |
| CD Mold Release A | gal. | — | 7.00 |
| B | gal. | — | 5.00 |
| **Colite Concentrate (dms.)** | gal. | — | .90 |
| Concentrex | lb. | — | .25 |
| Dag Dispersions No. 197 | lb. | 1.85 | 2.90 |
| D.C. 7 Compound | lb. | 5.13 | 6.50 |
| D.C. Emulsion No. 7 | lb. | 1.59 | 2.07 |
| No. 8 | lb. | 1.46 | 1.98 |
| No. 35 | lb. | 1.46 | 3.50 |
| No. 35A | lb. | 1.46 | 3.50 |
| No. 35B | lb. | 1.46 | 3.50 |
| D.C. Mold Release Fluid | lb. | 3.70 | 6.00 |
| **Dipex** | lb. | .14 | .18 |
| Dri-Lube | lb. | — | .22 |
| Glydag G | lb. | 1.30 | 2.45 |
| Hawkeye Flake (dlvd.) | lb. | .13¾ | .14¾ |
| Igepal CO-430 | lb. | — | .39 |
| CO-530 | lb. | — | .36 |
| CO-630 | lb. | — | .36 |
| Igepon AP-78 | lb. | — | .48 |
| T-51 | lb. | — | .13½ |
| Kokobace R | lb. | .18 | .18½ |

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**SILICONE BOMB MOLD LUBE**

*The Best Mold Release You Can Buy! Forms a "Slick Quick"!*

UNDILUTED
ODORLESS
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SAFE

Dry Freon Propellent Protects Your Molds

**PRICES:**
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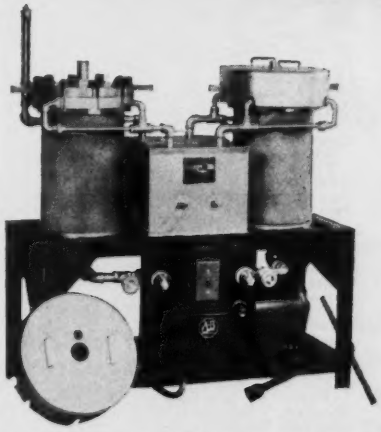
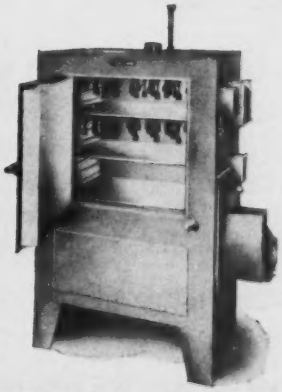
3514 LEE ROAD WYoming 1-1424 CLEVELAND 20, OHIO

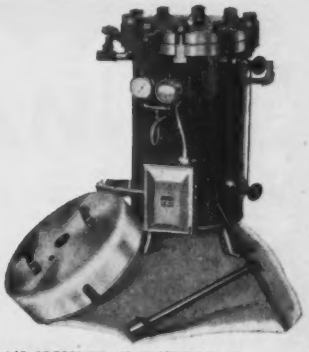
**APPARATUS FOR THE RUBBER LABORATORY**



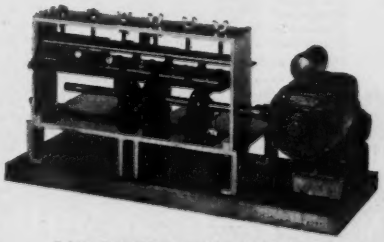
COMBINATION BIERER-DAVIS OXYGEN AGING AND AIR HEAT TEST OUTFIT (Outfit shown with 2 bombs. Outfit with one bomb can also be supplied.) A.S.T.M. D 572-52 and D 454-52.



EMERSON OVEN for Oven Aging of Rubber Samples A.S.T.M. D-573-52.

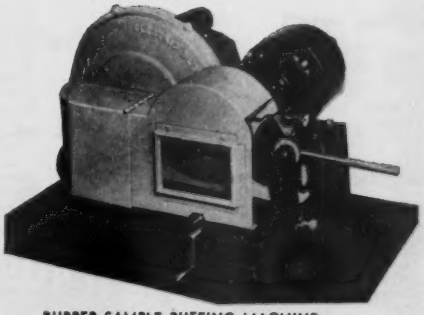


AIR PRESSURE HEAT TEST BOMB (STEAM HEATED) A.S.T.M. D 454-52



ROSS RUBBER FLEXING MACHINE

**EMERSON APPARATUS CO.**
183 Tremont Street
Melrose, Mass.



RUBBER SAMPLE BUFFING MACHINE (Shown with Rotary Platen and Dust Collector with Suction Blower.)

## LUBRICANTS, MOLD (Cont'd)

| | | | |
|---|---|---|---|
| Linde Silicone L-45 | lb. | 3.72 | 4.80 |
| LE-45 | | 1.46 | 2.50 |
| **Lubrex** | **lb.** | **.25** | **.30** |
| Lubri-Flo | gal. | 10.00 | 12.00 |
| **Migralube** | **lb.** | —— | **.35** |
| **Mold Lubricant No. 72 Conc.** | **gal.** | **2.50** | **4.00** |
| No. 735 | gal. | 1.26 | 2.75 |
| No. 769 | gal. | 1.20 | 2.60 |
| **No. 880** | **gal.** | **1.12** | **2.50** |
| **No. 856** | **gal.** | **2.00** | **4.00** |
| No. 935 | gal. | 1.75 | 3.25 |
| No. 980 | gal. | 1.65 | 3.15 |
| Moldeze No. 3 | gal. | 5.00 | 6.00 |
| **Mold-Brite** | **gal.** | —— | **1.50** |
| **Mold-White** | **gal.** | —— | **2.00** |
| Monopole Oil MD | lb. | —— | .18 |
| Olate Flakes | lb. | .22¼ | .23¼ |
| Orvus WA Paste (dms.) | lb. | —— | .23 |
| Polyglycol 15-200 | lb. | .25 | .28¼ |
| E4000 | lb. | .31 | .37 |
| **Prodag** | **lb.** | **.28** | **.42** |
| Purity Flake (dlvd.) | lb. | .17¾ | .18¾ |
| Rubber-Flo | gal. | 1.25 | 2.00 |
| **Rubber-Glo** | **gal.** | —— | **.94** |
| Rusco Mold Paste | lb. | —— | **.25** |
| **Sericite (l.c.l.)** | **ton** | **65.00** | **75.00** |
| SF-92 Silicone Fluid | lb. | 3.70 | 4.22 |
| SM-33 Silicone Emulsion | lb. | 1.50 | 1.68 |
| 55 | lb. | 1.46 | 2.00 |
| 61 | lb. | 1.46 | 1.68 |
| **Thermalube** | **lb.** | —— | **.13¾** |
| Ucon Lubricants | lb. | .26¼ | .27¾ |
| **Ulco Mold Soap** | **lb.** | **.12** | **.23** |

## LUBRICANTS, RUBBER

| | | | |
|---|---|---|---|
| Diglycol Stearate Neutral (and SE) (dms.) | lb. | —— | .25 |
| Emcol DS-50 | lb. | —— | .38 |
| RDH-S | lb. | —— | .27 |
| Extrud-o-Lube | gal. | —— | 1.54 |
| **G.B. Naphthenic Neutrals** | **gal.** | **.11** | **.18** |
| Ivory Chips | lb. | .18¾ | .19¾ |
| Latex-Lube GR (dlvd.) | lb. | .19¼ | .20 |
| **Propylene Stearate (dms.)** | **lb.** | **.68** | **.78** |

## LUBRICANTS, RUBBER SURFACE

| | | | |
|---|---|---|---|
| Barium Stearate | lb. | .37 | .42 |
| Calcium Stearate | lb. | .35 | .40 |
| D.C. 4 Compound | lb. | 5.13 | 6.50 |
| D.C. 200 Fluid | lb. | 3.70 | 6.00 |
| Glycerized Lubricant | gal. | — | 1.48 |
| Glydag B | lb. | 1.50 | 2.10 |
| G | lb. | 1.30 | 2.45 |
| Hydro-Zinc | lb. | —— | .20 |
| Latex-Lube Pigmented (dlvd.) | lb. | .17¼ | .18¼ |
| R-66 (factory) | lb. | —— | .16½ |
| Liqui-Lube (dlvd.) | lb. | —— | .16¼ |
| N.F. (dlvd.) | lb. | —— | .16¾ |
| N.T. (dlvd.) | lb. | —— | .16¾ |
| Polyethylene Glycol | lb. | .22 | .26 |
| Rexarol | lb. | —— | **.13** |
| Rubber Free (Concentrate) | gal. | —— | 1.44 |
| Jel | lb. | .18 | .21½ |
| **Separex** | **lb.** | —— | **.25** |
| Stock-Lube | lb. | —— | .19 |
| Slab-Dip | lb. | —— | .16 |
| Wet-Zinc | lb. | —— | .22¼ |
| Zinc Stearate | lb. | .37 | .42 |
| Z.S.D. Dispersion | lb. | —— | .20 |

## MOLD CLEANERS

| | | | |
|---|---|---|---|
| Actusol (dlvd.) | gal. | 1.45 | 1.65 |
| Alkon (dlvd.) | lb. | .16 | .16½ |
| Metso Anhydrous | cwt. | 4.85 | 7.10 |
| Metso 99 | cwt. | 4.50 | 6.75 |
| Metso 200 | cwt. | 6.00 | 6.75 |
| Metso Granular | cwt. | 4.00 | 6.25 |
| Orvus Extra Granules | lb. | .22½ | .23½ |
| Rubber-Sol | gal. | 2.97 | 3.97 |
| Sprex A.C. (dlvd.) | lb. | .17¾ | .18¾ |

## PEPTIZING AGENTS

| | | | |
|---|---|---|---|
| Peptizer P-12 | lb. | .95 | 1.25 |
| Pepton 22 Plasticizer | lb. | .79 | .82 |
| RPA 2 | lb. | —— | .78 |
| 3 | lb. | —— | .47 |
| 3 Conc. | lb. | —— | .97 |
| 5 | lb. | —— | .59 |
| 6 | lb. | —— | 1.58 |

## PLASTICIZERS & SOFTENERS

| | | | |
|---|---|---|---|
| AA (dms.) | lb. | —— | .19½ |
| **Acto 500** | **lb.** | —— | **.09** |
| Adipol BCA (dms.) | lb. | .47 | .47½ |
| 2EH | lb. | .44 | .47¾ |
| 10A | lb. | .44 | .47¾ |
| ODY | lb. | .53¾ | .54¾ |
| American Pine Tar | lb. | .0410 | .0678 |
| Arneel | | .27 | .39 |
| Arolene 1980 (c.l.) | lb. | —— | .10 |
| Aromatic Plasticizer 10 (and 25) (dms.) | lb. | .06 | .06½ |
| **Aromatic Tar** | **gal.** | **.0573** | **.1973** |

## PLASTICIZERS & SOFTENERS (Cont'd)

| | | | |
|---|---|---|---|
| Bardol | lb. | .02¾ | .03¾ |
| B | lb. | .06¼ | .06½ |
| Bayol D | gal. | —— | **.382** |
| F | gal. | —— | .52 |
| Beeswax, Bleached | lb. | .70 | .75 |
| Yellow Refined | lb. | .57 | .62 |
| Bondogen | lb. | .55 | .60 |
| B.R.C. No. 20 | lb. | .0150 | .0175 |
| B.R.H. 2 | lb. | .0213 | .0351 |
| BRS 700 | lb. | .02 | .0285 |
| B.R.T. 3 | lb. | .0180 | .0265 |
| 4 | lb. | .0250 | .0260 |
| 7 | lb. | .03 | .031 |
| B.R.V. | lb. | .0475 | .0565 |
| Bunarex Resins | lb. | .06½ | .07½ |
| **Bunatak AH** | **lb.** | **.08** | **.09** |
| U | lb. | —— | .17½ |
| No 90 | lb. | —— | .09 |
| No. 210 | lb. | —— | .14 |
| **Burgundy Pitch** | **lb.** | **.0843** | **.0888** |
| Butac | lb. | .11¾ | .12¾ |
| Butoxyethyl Diglycol Carbonate (dms.) | lb. | .40 | .41 |
| Butyl Benzyl Sebacate | lb. | .87 | .89 |
| Butyl Carbitol Perlargonate (dms.) | lb. | —— | .64½ |
| Butyl Cellosolve Perlargonate (dms.) | lb. | —— | .68 |
| Butyl Palmitate | lb. | —— | .26½ |
| Butyl Stearate (dms.) | lb. | .24 | .25 |
| BWH-1 | lb. | .16 | .17 |
| Cabflex DDA | lb. | .44¾ | .47¾ |
| DDP | lb. | .34 | .37 |
| Di-BA | lb. | .43¼ | .46¼ |
| Di-OA | lb. | .44¾ | .47¾ |
| Di-OP | lb. | .34 | .37 |
| Di-OZ | lb. | .52 | .54¾ |
| ODA | lb. | .44¾ | .47¾ |
| ODP | lb. | .34 | .37 |
| Cabol 100 | lb. | .02 | .07 |
| Califlux 510, 550 | lb. | .02½ | .03¼ |
| **G.P.** | **lb.** | **.0125** | **.02** |
| R-100 | lb. | .04½ | .05¼ |
| TT | lb. | .0170 | .0245 |
| Candelilla Wax, Prime | lb. | .74 | .77 |
| Capryl Benzyl Sebacate | lb. | .89 | .91 |
| Carbowax 4000 (dms.) | lb. | .31 | .32 |
| **Cardolite 615** | **lb.** | **.33¾** | **.36¾** |
| 816 | lb. | .25¾ | .28¾ |
| Carnauba Wax, Crude | lb. | .82 | 1.00 |
| Refined | lb. | .84 | 1.00 |
| Yellow | lb. | 1.16 | 1.30 |
| Castorwax | lb. | —— | .26½ |
| Celluflex (dms.) | lb. | .35 | .40 |
| 112 (t.c., dlvd.) | lb. | —— | .33 |
| 179-A (t.c., dlvd.) | lb. | —— | .33 |
| 179-C (t.c., dlvd.) | lb. | —— | .33 |
| 179-EG (t.c., dlvd.) | lb. | —— | .33 |
| DBP (t.c., dlvd.) | lb. | —— | .33 |
| DOP (t.c., dlvd.) | lb. | —— | .34 |
| TPP (dms. eqld.) | lb. | —— | .39 |
| Ceresine Wax | lb. | .14 | .26 |
| Chlorowax 40 | lb. | .14½ | .15½ |
| CTLA Polymer | gal. | .20 | .36 |
| Cumar Resins | lb. | .06½ | .17 |
| Darex DBP | lb. | .33 | .35¾ |
| DOP | lb. | .34 | .37 |
| DIOP | lb. | .34 | .37 |
| D.B.M. | lb. | .32 | .34¾ |
| Degras, Common | lb. | —— | .14 |
| Diallyl Phthalate (dms.) | lb. | .47 | .52¾ |
| Dibenzyl Sebacate | lb. | .88 | .90 |
| Dibutoxethyl Sebacate | lb. | —— | .5634 |
| Dibutyl Phthalate | lb. | .33 | .35¾ |
| Dibutyl Sebacate | lb. | .71 | .74 |
| Dicapryl Adipate | lb. | .43 | .45 |
| Dicapryl Phthalate | lb. | .32 | .35¼ |
| Dicapryl Sebacate | lb. | .66½ | .68½ |
| Di-Carbitol Phthalate (dms.) | lb. | .42 | .42½ |
| Dicyclohexyl Phthalate | lb. | .58¼ | .59¼ |
| Diethyl Phthalate (t.c.) | lb. | .25 | .27¾ |
| Di-2-ethylhexyl Phthalate (t.c.) | lb. | —— | .34 |
| Dihexyl Adipate | lb. | .42 | .44 |
| Dihexyl Phthalate | lb. | .33 | .35 |
| Dihexyl Sebacate | lb. | .67 | .70 |
| Diisobutyl Azedate | lb. | —— | .47¾ |
| Di-iso-octyl Adipate (dms.) | lb. | .44¾ | .47¾ |
| Di-iso-octyl Phthalate (t.c.) | lb. | .34 | .37 |
| Dimethyl Phthalate (t.c.) | lb. | .27½ | .30¼ |
| Dimethyl Sebacate | lb. | 1.25 | 1.27 |
| Dinopol | lb. | .37 | .38 |
| Dioctyl Phthalate (dms.) | lb. | .34 | .37 |
| Dioctyl Sebacate (dms.) | lb. | .66½ | .69 |
| D.I.O.P. (dms.) | lb. | .36 | .37 |
| Dipolymer Oil | gal. | .33 | .48 |
| Dispersing Oil No. 10 | lb. | .06 | .06¼ |
| Dutrex 6 | lb. | —— | .02 |
| 15E | gal. | —— | .10 |
| Elastex 10-P | lb. | .34 | .37 |
| 50-B | lb. | .27 | .30 |
| DCHP | lb. | .59 | .60 |
| Emulphor EL-719 | lb. | —— | .62 |
| Estac | lb. | —— | .16 |
| Ethox (dms.) | lb. | .45 | .45½ |
| Flexol B-400 | lb. | .27 | .28 |
| DOP | lb. | .36 | .37 |
| TOF | lb. | .47¾ | .48¾ |
| 3GH | lb. | .45½ | .46 |
| 3GO | lb. | .54½ | .55 |
| 4GO | lb. | .35½ | .36½ |
| Flexricin P-1 | lb. | —— | .32 |
| P-4 | lb. | —— | .31 |
| P-4C | lb. | —— | .42½ |
| P-6 | lb. | —— | .37 |
| P-8 | lb. | —— | .33 |

## PLASTICIZERS & SOFTENERS (Cont'd)

| | | | |
|---|---|---|---|
| Fortex (dms.) | lb. | .12½ | .14½ |
| Galex W-100 | lb. | .15½ | .19¼ |
| **G. B. Light Process Oil** | **lb.** | **.025** | **.0325** |
| Medium Process Oil | lb. | .03½ | .04¼ |
| G. B. Naphthenic Neutrals | gal. | .11 | .18 |
| Good-Rite GP233 | lb. | .44¾ | .47¾ |
| GP261 | lb. | .34 | .37 |
| Harflex 500 (dms.) | lb. | .31½ | .33½ |
| Herron-H.T. | gal. | .16 | .27 |
| Herron-Plas | lb. | —— | **.03¾** |
| Herron-Wax | lb. | .05¼ | .06 |
| No. 23 | lb. | .08¼ | **.08¾** |
| **No. 24** | **lb.** | **.07¾** | **.07¾** |
| **HSC No. 13** | **lb.** | **.27** | **.30** |
| **Indonex 632½ (633½, 634½, 637½)** | **gal.** | **.11** | **.17** |
| Kapsol | lb. | .34¼ | .35¼ |
| **Kenflex** | **lb.** | **.18** | **.27** |
| Kesscoflex 101 (dms.) | lb. | —— | .39 |
| 102 (dms.) | lb. | —— | .32½ |
| 103 (dms.) | lb. | —— | .41½ |
| 104 (dms.) | lb. | —— | .48 |
| 105 (dms.) | lb. | —— | .33¼ |
| 106 (dms.) | lb. | —— | .35½ |
| 108 (dms.) | lb. | —— | .37 |
| 109 (dms.) | lb. | —— | .36¾ |
| KP 23 (dms.) | lb. | .31 | .32 |
| 90 (dms.) | lb. | .47 | .48 |
| 140 (dms.) | lb. | .48 | .48½ |
| 201 (dms.) | lb. | .58¼ | .59¼ |
| 220 (dms.) | lb. | .33 | .34 |
| 555 (dms.) | lb. | .33¼ | .33¼ |
| Kremol 40 | gal. | .36 | .46 |
| 50 | gal. | .39 | .49 |
| Kronisol (dms.) | lb. | .35 | .35½ |
| Kronitex AA dms.) | lb. | .35 | .36 |
| I (dms.) | lb. | .35 | .36 |
| Lanolin, Tech. Anhydrous | lb. | —— | .28 |
| Lead Oleate | lb. | —— | .30½ |
| Lindol (dms., t.c.) | lb. | .33 | .36 |
| 2-Mercaptoethanol (drums) | lb. | 1.25 | 1.50 |
| Methyl Laurate | lb. | .25 | .27 |
| **Methyl Oleate** | **lb.** | —— | **.20** |
| Methyl Stearate (dms.) | lb. | —— | .30 |
| Montan Wax, Crude | lb. | .13 | .14 |
| Montan Wax | lb. | —— | .30½ |
| Morflex | lb. | .32 | .69½ |
| MR 2088 (dms.) | lb. | —— | .19 |
| Natac | lb. | .11¼ | .12¼ |
| Nebony Resins (dms.) | lb. | .04 | .04½ |
| **Neolene 210 (t.c.)** | **lb.** | —— | **.16** |
| **212 (t.c.)** | **lb.** | —— | **.14** |
| **220 (t.c.)** | **lb.** | —— | **.15** |
| **Nerium** | **lb.** | —— | **.09** |
| Nevillac Resins (dms.) | lb. | .31 | .85 |
| Neville Resins (dms.) | lb. | .12 | .18 |
| Nevindene Resins (dms.) | lb. | .15 | .18 |
| Nevinol (dms.) | lb. | —— | .20 |
| Nuba 1 (and 2) (dms.) | lb. | .05¼ | .06¼ |
| 3X (dms.) | lb. | .07¼ | .08¼ |
| **15 (and 30) Oil (dms.)** | **lb.** | **.36¼** | **.38** |
| No. 480 Oil Proof Resin | lb. | —— | .18 |
| Ohopex Q10 (dms.) | lb. | .34 | .35 |
| R9 (dms.) | lb. | .37¼ | .37¾ |
| Opalwax | lb. | .37 | .38 |
| Ortho-Nitrobiphenyl | lb. | .13 | .15 |
| **Ozokerite Wax No. 64 White** | **lb.** | .26 | .27 |
| Yellow | lb. | .24 | .25 |
| **Palm Oil** | **lb.** | —— | .11 |
| Paradene Resins (dms.) | lb. | .06½ | .07½ |
| Para Flux (dms.) | gal. | .1925 | .2025 |
| 2016 (dms.) | gal. | .22 | .23 |
| Para Lube (l.c.l.) | lb. | .046 | .048 |
| Parmo | lb. | .06 | .13½ |
| Pepton 22 Plasticizer | lb. | .79 | .82 |
| PG-16 | lb. | .38¼ | .40 |
| Picco 10 (and 25) | lb. | —— | .13½ |
| 60 (and 75) | lb. | —— | .13 |
| 100 | lb. | .13 | .13½ |
| Piccocizer 30 | lb. | .05½ | .07 |
| **Piccolastic A (and B, C, D, E)** | **lb.** | .28 | .29 |
| FT, FHF and FN | lb. | .1815 | .1965 |
| T-135 | lb. | .22¾ | .23¼ |
| Piccolyte S Resins | lb. | .18½ | .20 |
| Piccopale Resins | lb. | .12 | .13 |
| Piccoumaron Resins | lb. | .06½ | .18 |
| Pigmentar | lb. | .0389 | .0678 |
| Pigmentaroil | lb. | .0394 | .0678 |
| **Plastac M** | **lb.** | —— | **.09¼** |
| Plasticizer 2286 | lb. | —— | **.26¼** |
| Plasticizer 4141 | lb. | .56¾ | .66¾ |
| Plasticizer ODN | lb. | .31 | .37 |
| Plasticizer SC | lb. | .54¼ | .56¾ |
| Plasticizer W-13 | lb. | .37 | **.38¾** |
| **Plasticizer XP-3** | **lb.** | —— | **.50** |
| Plastoflex 50 | lb. | .34¼ | .35¼ |
| 55 | lb. | .31¾ | .32¾ |
| 520 | lb. | .37½ | .38½ |
| VS | lb. | .38¾ | .39¼ |
| **Plastogen** | **lb.** | **.07¾** | **.08** |
| Plastolein 9050 (c.l.) | lb. | .56 | .59 |
| 9055 | lb. | .35 | .38 |
| 9058 | lb. | .52 | .55 |
| 9250 | lb. | .27 | .30 |
| 9715 | lb. | .35 | .38 |
| **Plastone** | **lb.** | **.27** | **.30** |
| Polycin 783 | lb. | —— | .24½ |
| Polycizer 162 | lb. | .34 | .37 |
| 332 | lb. | .44¾ | .47¾ |
| ED | lb. | —— | .56¾ |

STANLEY
RUBBER CUTTERS
*Modern Way to CUT*
**FOAM RUBBER**

NOS. 994-996

In operation at The Sponge Rubber Co., Inc., Shelton, Conn.

***No Pinch • No Waste***

***Cuts Even • Cuts Quicker***

Operator can follow template or any marked pattern. Cuts straight lines, curves or angles at up to 30 ft. a minute. For further information write, 426 Myrtle St., New Britain, Conn.

STANLEY *Electric Tools*

HARDWARE • TOOLS • STEEL STRAPPING • STEEL

***NEW!*** **FOR LATEX COMPOUNDERS**

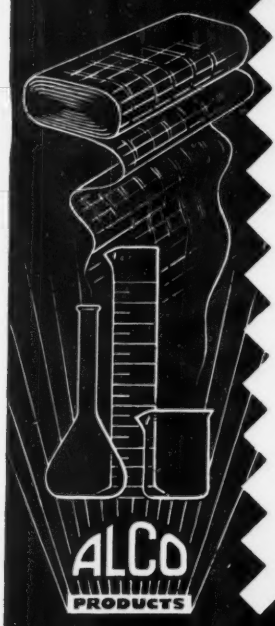
**A COMPLETE SERVICE**

- ANTIOXIDANT DISPERSIONS
- ACCELERATOR DISPERSIONS
- PIGMENT DISPERSIONS
- SULPHUR DISPERSIONS
- ANTI-TACK AGENTS
- ZINC OXIDE DISPERSIONS
- DEFOAMERS
- TACKIFIERS

Our Laboratories will be pleased to suggest complete formulations to solve your specific problems in coating, impregnating, laminating, rubberizing, dipping, molding and adhesives.

**RUBBA INC.**

1015 E. 173rd ST.
New York, N.Y.




# ALCOGUM AN-10

(SODIUM POLYACRYLATE)

Serves the latex compounding industry both as stabilizer and thickener.

ALCOGUM AN-10 is a 10% solution, having a pH of 10. Provides more effective viscosity control of compounds even during prolonged storage, and greater dilutability through adequate stabilization.

Distributors for Firestone Liberian Latex.

•

Our sales and technical staffs are at your disposal.

**ALCO OIL & CHEMICAL CORPORATION**

TRENTON AVE. and WILLIAM ST., PHILADELPHIA 34, PA.

**NEW ENGLAND OFFICE**
Alco Oil & Chemical Corp.
610 Industrial Trust Bldg.
111 Westminster St.
Providence 3, R. I.
Phone: ELmhurst 1-4559

## PLASTICIZERS & SOFTENERS (Cont'd)

| | | | |
|---|---|---|---|
| Polyco 438 | lb. | .32 - | .34 |
| Polymel C-130 | lb. | .19½ - | .20½ |
| D | lb. | .23½ - | .24½ |
| 6 | lb. | .05¾ - | .07¾ |
| Process Oil C-255 (c.l.) | gal. | — - | .22 |
| Propylene Stearate (dms.) | lb. | — - | .32 |
| PT 67 Light Pine Oil (dms.) | gal. | — - | .60 |
| 101 Pine Tar Oil (t.c., dms) | gal. | 33½ - | .44½ |
| 400 Pine Tar (600, 800) (t.c., dms.) | gal. | .35 - | .46 |
| PX-104 | lb. | .34 - | .42 |
| PX-108 | lb. | .38 - | .46 |
| PX-208 | lb. | .41½ - | .49 |
| PX-404 | lb. | .60 - | .68 |
| Reogen | lb. | .13¼ - | .13½ |
| 465 Resin (dms.) | lb. | .07 - | .07½ |
| Resin 731-C | cwt. | — - | 15.00 |
| Resin C | lb. | .0225 - | .0310 |
| Resinex | lb. | .03¼ - | .03¾ |
| L-4 | lb. | .02¾ - | .03 |
| Rexflex | lb. | — - | .15 |
| Rosin Oil | gal. | .54 - | 1.20 |
| R.S.O. Softening Oil | lb. | .03 - | .05 |
| Rubberol | lb. | — - | .25¾ |
| Rubtar | gal. | — - | .40 |
| Santicizer B-16 | lb. | .52 - | .54¾ |
| E-15 | lb. | .51 - | .53¾ |
| M-17 | lb. | .48 - | .50¾ |
| No. 107 | lb. | .38¾ - | .39¾ |
| No. 140 | lb. | .33 - | .35¾ |
| No. 141 | lb. | .37 - | .39¾ |
| No. 160 | lb. | .25 - | .28 |
| Sherolatum | lb. | .03½ - | .06 |
| Softener No. 20 | gal. | .09 - | .25 |
| Solarite Resin No. 1 | lb. | .16½ - | .22½ |
| Staflex DBES | lb. | .67½ - | .68½ |
| DOS | lb. | .68 - | .69 |
| IXA | lb. | .34 - | .35 |
| KA | lb. | .37¾ - | .38¾ |
| Stanolind Petrolatum | lb. | .053 - | .089 |
| Wax | lb. | .31 - | .33 |
| Sunny South Burgundy Pitch | lb. | .0980 - | .1025 |
| Sunny South Pine Tar | lb. | .0389 - | .0678 |
| Sunny South Rosin Oil | gal. | .58 - | .87½ |
| Superla Wax | lb. | .34½ - | .44 |
| Syncera Wax | lb. | .23 - | .34 |
| Syn Tac (c.l.) | gal. | — - | .33 |
| Synthetic Revertant Oil | lb. | — - | .16 |
| Tar, Refined | gal. | .12 - | .17 |
| K-Tarnel NR (t.c.) | lb. | — - | .0851 |
| Terpene A | gal. | — - | .65 |
| TP-90B | lb. | — - | .59 |
| TP-95 | lb. | — - | .65 |
| Transphalt Resins | lb. | .02¼ - | .03¾ |
| Triacetin | lb. | .40 - | .47 |
| Tributyl Phosphate (dms.) | lb. | .52 - | .53 |
| Tricresyl Phosphate (t.c.) | lb. | .33 - | .35 |
| Turgum S | lb. | .10 - | .11 |
| Vanadiset A | lb. | .02½ - | .07 |
| Vistac No. 1 | gal. | 1.00 - | 1.21 |
| P | lb. | .18 - | .18½ |
| Vopcolene 50 | lb. | — - | .37 |
| Witcizer 100 | lb. | .31 - | .32 |
| 200 | lb. | .21 - | .26½ |
| 201 | lb. | .23½ - | .29 |
| 300 | lb. | .35¾ - | .36¾ |
| 312 | lb. | .36¾ - | .37¾ |
| 412 | lb. | .47¾ - | .48¾ |
| Witresin—Granular | ton | 41.00 - | 43.00 |
| Solid | ton | 36.00 - | 38.00 |

## PROCESSING AIDS

| | | | |
|---|---|---|---|
| Castor Oil, Processed (dms.) | lb. | — - | .21½ |
| Refined (dms.) | lb. | — - | .19½ |
| Dutrex 7 | lb. | .12 - | .20 |
| ELA | lb. | — - | .82 |
| Emcol MAS | lb. | — - | .44 |
| Kenflex N | lb. | — - | .18 |
| Millrex | lb. | — - | .15 |
| Resin No. 510 | lb. | .13½ - | .16½ |
| Zyrox | lb. | .50 - | .79 |

## PROTECTIVE & STABILIZING AGENTS

| | | | |
|---|---|---|---|
| Acacia | lb. | .12¾ - | .21 |
| Alpha Protein | lb. | .24 - | .28 |
| Ammonium Alginate | lb. | — - | 1.02 |
| Aroostoocrat | lb. | — - | .07½ |
| Carob Bean Flour | lb. | — - | .46 |
| Casein | lb. | .24 - | .31 |
| Emcol K-8300 (dms.) | lb. | .19 - | .20 |
| Ethylene Diamine 68% | lb. | .44 - | .47 |
| Gum Arabic | lb. | — - | .19 |
| Karaya Gum | lb. | — - | .25 |
| Locust Bean Gum | lb. | — - | .31 |
| Prosein | lb. | .0600 - | .0630 |
| Rex Compound No. 2801 | lb. | — - | .15 |
| Stablex B | lb. | .50 - | .95 |
| K | lb. | .27 - | .35 |

## RECLAIMING AGENTS

| | | | |
|---|---|---|---|
| Amalgamator Z-4 | | — - | .32 |
| Armeen C | lb. | .45 - | .47 |
| Mixed Crude | lb. | .17 - | .23 |
| T | lb. | .29 - | .31 |
| No. 517 H.B. Oil | gal. | .11½ - | .16½ |
| 535 | gal. | .22 - | .27 |

## RECLAIMING AGENTS (Cont'd)

| | | | |
|---|---|---|---|
| Burco RA | lb. | .05½ - | .08¼ |
| C-6 Oil (and 28, 32) | gal. | .33 - | .38 |
| C-10 Oil | gal. | .25 - | .30 |
| C-33 | gal. | — - | .21½ |
| C-42 | gal. | — - | .23 |
| Caustic Soda—Flake 76% (c.l., dms.) | cwt. | — - | 4.10 |
| Liquid 50% (t.c.) | cwt. | — - | 2.55 |
| Solid 76% (c.l., dms.) | cwt. | — - | 3.70 |
| Cresylic Acid (99-100%) | gal. | .90 - | 1.23 |
| D-4 | gal. | — - | .27 |
| E-5 | gal. | — - | .25 |
| Flake Calcium Chloride (77-80%) | ton | — - | 27.00 |
| G. B. Reclaiming Oil | gal. | .12 - | .18 |
| CD-10 | gal. | .10 - | .16 |
| CD-50-U | gal. | .18 - | .24 |
| Gensol No. 6 (t.c.) | gal. | — - | .40 |
| Heavy Aromatic Naphtha | gal. | — - | .13¼ |
| LX-77 Reclaiming Solvent | gal. | .21 - | .33 |
| LX-572 Reclaiming Oil | gal. | .27 - | .32 |
| LX-777 Reclaiming Oil | gal. | .23 - | .33 |
| Neo-Fat D-242 | lb. | .05½ - | .07¼ |
| PRR 1 | gal. | .15 - | .35 |
| PT 67 Light Pine Oil (dms.) | gal. | — - | .60 |
| PT101 Pine Tar Oil (t.c., dms.) | gal. | .33½ - | .44¼ |
| Q Oil | gal. | — - | .286 |
| Reclaiming Oil 3186 (t.c.) | gal. | .28 - | .38½ |
| Reclaiming Oil 3186-G | gal. | .25 - | .36½ |
| Reclaiming Reagent No. 1431 | lb. | .21 - | .25 |
| R.P.A. No. 3 | lb. | — - | .47 |
| RR-10 | lb. | — - | .36 |
| Soda Ash (c.l., bags) | cwt. | — - | 1.65 |
| Solvent 534 | gal. | .20½ - | .26½ |
| Solvent Oil 21 | gal. | .24 - | .29 |
| C-42 | gal. | .23 - | .28 |
| Union Solvent 4060-O | gal. | — - | .184 |
| X-1 Resinous Oil | lb. | .0210 - | .0275 |

## REINFORCING AGENTS—CARBON BLACK

### Channel, Hard Processing (HPC) (bags)

| | | | |
|---|---|---|---|
| Atlantic HPC-98 | lb. | .0740 - | .1225 |
| Continental F | lb. | .0740 - | .1225 |
| Croflex | lb. | .0740 - | .1225 |
| Dixiedensed (and S) | lb. | .0740 - | .1225 |
| HX Compact | lb. | .0740 - | .1225 |
| Kosmobile (and S) | lb. | .0740 - | .1225 |
| Micronex HPC | lb. | .0740 - | .1225 |
| Spheron 4 | lb. | .0740 - | .1225 |
| Witco No. 6 | lb. | .0740 - | .1225 |

### Channel, Medium Processing (MPC) (bags)

| | | | |
|---|---|---|---|
| Atlantic MPC-95 | lb. | .0740 - | .1225 |
| Collocarb | lb. | .0705 - | .1105 |
| Continental A | lb. | .0740 - | .1225 |
| Croflex TH | lb. | .0740 - | .1225 |
| Dixiedensed HM (and S-66) | lb. | .0740 - | .1225 |
| Huber Arrow TX | lb. | .0740 - | .1225 |
| Kosmobile HM (and S-66) | lb. | .0740 - | .1225 |
| Micronex Standard | lb. | .0740 - | .1225 |
| Spheron 6 | lb. | .0740 - | .1225 |
| Texas M | lb. | .0740 - | .1225 |
| Witco No. 1 | lb. | .0740 - | .1225 |

### Channel, Easy Processing (EPC) (bags)

| | | | |
|---|---|---|---|
| Atlantic EPC E-42 | lb. | .0740 - | .1225 |
| Collocarb | lb. | .0705 - | .1105 |
| Continental AA | lb. | .0740 - | .1225 |
| Croflex 77 | lb. | .0740 - | .1225 |
| Dixiedensed 77 | lb. | .0740 - | .1225 |
| Kosmobile 77 | lb. | .0740 - | .1225 |
| Micronex W-6 | lb. | .0740 - | .1225 |
| Spheron 9 | lb. | .0740 - | .1225 |
| Texas E | lb. | .0740 - | .1225 |
| Witco No. 12 | lb. | .0740 - | .1225 |
| Wyex | lb. | .0740 - | .1225 |

### Channel, Conductive (CC) (bags)

| | | | |
|---|---|---|---|
| Continental R-40 | lb. | .2300 - | .3000 |
| Dixie 5 Dustless | lb. | .1200 - | .1900 |
| Dixie Voltex | lb. | .2300 - | .3000 |
| Kosmink Dustless | lb. | .1200 - | .1900 |
| Kosmos Voltex | lb. | .2300 - | .3000 |
| Spheron C | lb. | .1400 - | .1850 |
| Voltex | lb. | .2300 - | .3000 |

### Conductive Furnace Black (CFB) (bags)

| | | | |
|---|---|---|---|
| Aromex 115 | lb. | .0890 - | .1290 |
| Shawinigan Acetylene Black | lb. | .1700 - | .2600 |
| Vulcan C | lb. | .1100 - | .1530 |

### Furnace, Fast Extruding (FEF) (bags)

| | | | |
|---|---|---|---|
| Arovel | lb. | .0600 - | .1000 |
| Collocarb | lb. | .0590 - | .0990 |
| Continex | lb. | .0650 - | .1050 |
| Croflex 50 | lb. | .0600 - | .1000 |
| Dixie 50 | lb. | .0600 - | .1000 |
| Kosmos 50 | lb. | .0600 - | .1000 |
| Philblack A | lb. | .0600 - | .1000 |
| Statex M | lb. | .0600 - | .1000 |
| Sterling SO | lb. | .0600 - | .1000 |

## REINFORCING AGENTS—CARBON BLACK (Cont'd)

### Furnace, General Purpose (GPF) (bags)

| | | | |
|---|---|---|---|
| Dixie 35 | lb. | .0500 - | .0900 |
| Kosmos 35 | lb. | .0500 - | .0900 |
| Sterling V | lb. | .0500 - | .0900 |

### Furnace, High Modulus (HMF) (bags)

| | | | |
|---|---|---|---|
| Collocarb | lb. | .0470 - | .0870 |
| Continex HMF | lb. | .0550 - | .0950 |
| Croflex 40 | lb. | .0550 - | .0950 |
| Dixie 40 | lb. | .0550 - | .0950 |
| Kosmos 40 | lb. | .0550 - | .0950 |
| Modulex | lb. | .0550 - | .0950 |
| Statex 93 | lb. | .0550 - | .0950 |
| 930 | lb. | .0470 - | .0870 |
| Sterling L | lb. | .0550 - | .0950 |
| LL | lb. | .0550 - | .0950 |

### Furnace, Semi-Reinforcing (SRF) (bags)

| | | | |
|---|---|---|---|
| Collocarb | lb. | .0480 - | .0880 |
| Continex SRF | lb. | .0450 - | .0850 |
| Croflex 20 | lb. | .0450 - | .0850 |
| Dixie 20 | lb. | .0450 - | .0850 |
| Essex | lb. | .0450 - | .0850 |
| Furnex | lb. | .0450 - | .0850 |
| Gastex | lb. | .0500 - | .0900 |
| Kosmos 20 | lb. | .0450 - | .0850 |
| Pelletex | lb. | .0450 - | .0850 |
| NS | lb. | .0450 - | .0850 |
| Sterling NS | lb. | .0450 - | .0850 |
| Sterling R | lb. | .0500 - | .0900 |
| Sterling S | lb. | .0450 - | .0850 |

### Furnace, Fine (FF) (bags)

| | | | |
|---|---|---|---|
| Statex B | lb. | .0650 - | .1050 |
| Sterling 99 | lb. | .0650 - | .1050 |

### Furnace, High Abrasion (HAF) (bags)

| | | | |
|---|---|---|---|
| Aromex | lb. | .0790 - | .1190 |
| Collocarb | lb. | .0745 - | .0870 |
| Continex HAF | lb. | .0790 - | .1250 |
| Croflex 60 | lb. | .0790 - | .1190 |
| Dixie 60 | lb. | .0790 - | .1190 |
| Kosmos 60 | lb. | .0790 - | .1190 |
| Philblack O | lb. | .0790 - | .1190 |
| Statex R | lb. | .0790 - | .1250 |
| Vulcan 3 | lb. | .0790 - | .1220 |

### Furnace, Super Abrasion (SAF) (bags)

| | | | |
|---|---|---|---|
| Aromex 125 | lb. | .1100 - | .1500 |
| Philblack E | lb. | .1350 - | .1750 |
| Statex 125 | lb. | .1100 - | .1550 |
| Vulcan 9 | lb. | .1350 - | .1780 |

### Furnace, Super Abrasion, Intermediate (ISAF) (bags)

| | | | |
|---|---|---|---|
| Dixie 70 | lb. | .1100 - | .1550 |
| Kosmos 70 | lb. | .1100 - | .1550 |
| Philblack I | lb. | .1100 - | .1500 |
| Vulcan 6 | lb. | .1100 - | .1530 |

### Furnace, Super Conductive (SCF) (bags)

| | | | |
|---|---|---|---|
| Vulcan SC | lb. | .1800 - | .2230 |

### Thermal, Fine (FT) bags)

| | | | |
|---|---|---|---|
| P-33 (c.l.) | lb. | — - | .0550 |
| Sterling FT (c.l.) | lb. | — - | .0550 |

### Thermal, Medium (MT) (bags)

| | | | |
|---|---|---|---|
| Shellblack * | lb. | — - | .0250 |
| Sterling MT (c.l.) | lb. | — - | .0350 |
| MT Non-Staining (c.l.) | lb. | — - | .0450 |
| Thermax (c.l.) | lb. | — - | .0350 |
| Thermax, Stainless (c.l.) | lb. | — - | .0450 |

## REINFORCING AGENTS—SILICA

| | | | |
|---|---|---|---|
| Cab-o-sil (compressed) | lb. | — - | .81 |
| Hi-Sil | lb. | .10 - | .11½ |
| C | lb. | .11 - | .12½ |
| Santocel | lb. | .62 - | .64 |

## REINFORCING AGENTS—MISCELLANEOUS

| | | | |
|---|---|---|---|
| Angelo Shellac | lb. | .39 - | .49 |
| Darex Copolymer No. 3 | lb. | .47 - | .49 |
| X34 | lb. | .42 - | .44 |
| 43G | lb. | .42 - | .44 |
| Darex Copolymer Latex No. 3-L (and X34L) | lb. | .36½ - | .39 |
| Durez 12687 (and 12707) | lb | — - | .37 |
| Durez 13355 | lb. | — - | .29½ |
| Good-Rite Resin 50 | lb. | .42 - | .44 |
| Hetro | lb. | .31½ - | .32½ |
| Kralac A | lb. | .43 - | .44 |

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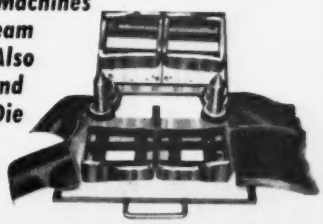

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## REINFORCING AGENTS—MISC (Cont'd)

| | | | |
|---|---|---|---|
| Lampblack | lb. | — | .12 |
| Marbon S and S-1 | lb. | .42 | .49 |
| 8000 | lb. | .42 | .49 |
| Marmix | lb. | .42 | .49 |
| Pliolite Latex 150 | lb. | .44 | .45 |
| Pliolite Resin-Rubber Masterbatches | lb. | .35 | .50 |
| Pliolite NR | lb. | .94 | .95 |
| Pliolite S3, S6, and S6B | lb. | .43 | .44 |
| Plio-Tuf G75C | lb. | .53 | .54 |
| G85C | lb. | .53 | .54 |
| Polyco 220 | lb. | .18¾ | .19¼ |

## RETARDERS

| | | | |
|---|---|---|---|
| Dutch Boy Normasal | lb. | — | .46 |
| ESEN | lb. | .35 | .37 |
| Harcopol 1183 | lb. | .70 | .74 |
| Retarder ASA | lb. | — | .57 |
| Retarder PD | lb. | .35 | .37 |
| Retarder W | lb. | — | .45 |
| Retardex | lb. | .47 | .50 |

## RUBBER SUBSTITUTES

### Mineral Rubber

| | | | |
|---|---|---|---|
| 38 | ton | 38.00 | 40.00 |
| Black Diamond | ton | 38.00 | 40.00 |
| Everlyte | ton | 47.00 | 54.00 |
| Gilsonite, Selects (c.l.) | ton | 37.00 | 38.00 |
| Hard Hydrocarbon (dms.) | ton | 46.50 | 48.50 |
| Herron Flake | ton | — | 45.00 |
| Pioneer | ton | 35.00 | 46.00 |

### Vulcanized Vegetable Oils (Factice)

| | | | |
|---|---|---|---|
| Amberex | lb. | .29 | .36 |
| Brown | lb. | .1310 | .2200 |
| Neophax | lb. | .1570 | .2680 |
| White | lb. | .1480 | .2520 |

### Miscellaneous Rubber Substitutes

| | | | |
|---|---|---|---|
| G.B. Asphaltenes | lb. | .06 | .06½ |
| Gilsowax B | lb. | 09 | .11 |
| Resin No. 1098 (drums) | lb. | — | .62 |
| No. 1198 | lb. | .46¾ | .49¾ |

## SOLVENTS

| | | | |
|---|---|---|---|
| Acetone (dlvd.) | lb. | .10½ | .11½ |
| American Dipentine | gal. | .34½ | .70 |
| American Pine Oil | gal. | .86⅝ | 1.04 |
| Amsco Lactol Spirits (t.c.) | gal. | — | .19 |
| Naphthol Spirits | gal. | — | .19 |
| Mineral Spirits | gal. | — | .17 |
| Rubber Solvent (t.c.) | gal. | — | .18 |
| Solv A (t.c.) | gal. | — | .27½ |
| Solv A-80 (t.c.) | gal. | — | .32½ |
| Solv B (t.c.) | gal. | — | .31 |
| Solv B-90 (t.c.) | gal. | — | .34 |
| Solv D (t.c.) | gal. | — | .32½ |
| Solv E | gal. | — | .31½ |
| Solv F | gal. | — | .32½ |
| Solv F-80 | gal. | — | .35½ |
| Special Naphtholite (t.c.) | gal. | — | .18 |
| Special Textile Spirits | gal. | — | .19 |
| Super Naphtholite | gal. | — | .18 |
| Textile Spirits (t.c.) | gal. | — | .19 |
| Amyl Chlorides, Mixed (l.c.l.) (drums) | lb. | .09¼ | .10¼ |
| Benzol 90% | gal. | — | .48 |
| Butyl Acetate (t.c.) | lb. | .15 | .16 |
| Butyl Alcohol (t.c.) | lb. | .15 | .16 |
| Secondary (dlvd.) | lb. | .13 | .14 |
| Tertiary (dlvd.) | lb. | .14 | .15 |
| Carbon Bisulfide, Tech. | lb. | .05¾ | .08½ |
| Carbon Tetrachloride | lb. | .08¼ | .09¼ |
| Cosol 1 | gal. | .37 | .43 |
| Cosol 2 | gal. | .42 | .48 |
| Cyclohexane | gal. | .70 | .72 |
| Cyclohexanone | lb. | .25 | .27 |
| Diacetone, Pure (dlvd.) | lb. | .14 | .15 |
| Dichlorethyl Ether (dms.) | lb. | .14½ | .15 |
| Formal (dms.) | lb. | .30¾ | .31¾ |
| Dichloropentane | lb. | .04¾ | .14¾ |
| Dicom | gal. | .30 | .42 |
| Halowax Oil | lb. | .28 | .41 |
| Heptanes (t.c.) | gal. | .17 | .22 |
| Hexalin Cyclohexanol | lb. | .20 | .22 |
| Hexanes (t.c.) | gal. | .17 | .22 |
| Isopropyl Alcohol, Ref. 99% (dlvd.) | gal. | .52 | .59 |
| Ether, Ref. (dlvd.) | lb. | .07 | .08 |
| Mersol | gal. | .43 | .79 |
| Mesityl Oxide (dlvd.) | lb. | .13½ | .14½ |
| Methyl Acetone Syn. (dms., dlvd.) | gal. | .66½ | .72¾ |
| Methyl Ethyl Ketone | lb. | .13 | .14 |
| Methyl Isobutyl Ketone (dlvd.) | lb. | .15 | .16 |
| N-5 Pentane Mix (t.c.) | gal. | — | .13½ |
| N-6 Hexanes (t.c.) | gal. | — | .14½ |
| N-7 Hexanes (t.c.) | gal. | — | .13½ |
| Penetrell | gal. | .34½ | .70 |
| Petrolene (t.c.) | gal. | — | .13125 |
| Picolines, Alpha, Refined | lb. | .44 | 1.00 |
| Mixed | lb. | — | .34 |
| Proprietary Solvent (dms.) | gal. | .51 | .72 |
| Propyl Acetate (t.c., dlvd.) | lb. | — | .10¾ |
| Alcohol (t.c., dlvd.) | lb. | — | .10 |

## SOLVENTS (Cont'd)

| | | | |
|---|---|---|---|
| PT 150 Pine Solvent (dms.) | gal. | — | .44 |
| Pyridine, Refined | lb. | .95 | 1.05 |
| Quinoline | lb. | .60 | 1.45 |
| Rubber Solvent (t.c.) | gal. | — | .16 |
| Rubsol (t.c.) | gal. | — | .11875 |
| Skellysolve B (Hexanes) (t.c.) | gal. | — | .158 |
| C (Heptanes) (t.c.) | gal. | — | .151 |
| E (Octanes) (t.c.) | gal. | — | .165 |
| R (Solvent Naphtha) | gal. | — | .129 |
| Solvent, Crude, Light | gal. | .19 | .28 |
| Solvesso 100 (t.c.) | gal. | .33 | .37 |
| 150 (t.c.) | gal. | .33 | .37 |
| Sunny South Dipentine | gal. | .34½ | .70 |
| Sunny South Pine Oil | gal. | .86⅝ | 1.04 |
| Sunray | gal. | .1140 | .1600 |
| Toluene (drums) | gal. | — | .28 |
| Toluol (t.c.) | gal. | — | .35 |
| Trichlorethane | lb. | .13 | .13½ |
| Triglycol Dichloride (dms.) | lb. | .63 | .64 |
| Union Thinner 1 | gal. | — | .183 |
| 3 | gal. | — | .183 |
| 5 | gal. | — | .173 |
| 7 | gal. | — | .173 |
| 2-50-W Hi-Flash | gal. | — | .41 |
| Xylol | gal. | .35 | .45 |

## STABILIZING AGENTS (for Vinyl Resins)

| | | | |
|---|---|---|---|
| Advastab No. 21 | lb. | — | 1.08 |
| Barca 10 | lb. | — | .80 |
| Barium Stearate | lb. | .37 | .42 |
| Basic Silicate White Lead | lb. | .17½ | .18½ |
| Bunatak Polymer No. 780 | lb. | — | .04 |
| No. 5514 | lb. | — | .35 |
| BVS | lb. | — | .73¾ |
| Calcium Ricinoleate | lb. | — | .48 |
| Cadmium Stearate | lb. | 1.40 | 1.44 |
| Calcium Stearate | lb. | .35 | .40 |
| Dutch Boy DS-207 | lb. | — | .54 |
| Plumb-O-Sil A | lb. | — | .29¾ |
| B | lb. | — | .31¼ |
| Tribase | lb. | — | .27½ |
| Dythal | lb. | — | .39½ |
| Ferro 120 (dms.) | lb. | .73¼ | .83¼ |
| 121 (dms.) | lb. | .68 | .78 |
| 200 (dms.) | lb. | 1.33 | 1.43 |
| 211 (dms.) | lb. | .65 | .75 |
| 221 (dms.) | lb. | 1.51 | 1.61 |
| 541 (dms.) | lb. | .35½ | .45½ |
| 541A (dms.) | lb. | .81¾ | .91¾ |
| 620 (dms.) | lb. | — | .77½ |
| 700 (dms.) | lb. | .48¾ | .58¾ |
| 900 (dms.) | lb. | 1.02¾ | 1.12¾ |
| 903 (dms.) | lb. | .65 | .75 |
| 909 (dms.) | lb. | 1.02¾ | 1.12¾ |
| 920 | lb. | — | .98 |
| 931 (dms.) | lb. | .75¼ | .85¼ |
| 1820 (dms.) | lb. | .90 | 1.00 |
| Harshaw 1-V-3 | lb. | .43 | .58 |
| 1-V-4 | lb. | .74 | .89 |
| 2-V-4 | lb. | 1.04 | 1.29 |
| 2-V-7 | lb. | 1.19 | 1.34 |
| 2-V-8 | lb. | 1.40 | 1.55 |
| 5-V-1 | lb. | .41 | .56 |
| 5-V-2 | lb. | .44 | .59 |
| 7-V-1 | lb. | .90 | 1.05 |
| 7-V-2 | lb. | .95 | 1.15 |
| 8-V-1 | lb. | 1.18 | 1.33 |
| 9-V-1 | lb. | .84 | .99 |
| 12-V-5 | lb. | .90 | 1.05 |
| 128-V-5 | lb. | .86 | 1.01 |
| Lead Stearate, Precip. | lb. | .32 | .39 |
| Fused | lb. | — | .37 |
| Lithium Stearate | lb. | .62 | .67 |
| Modicol N | lb. | .42 | .42½ |
| S | lb. | .30⅞ | .31⅜ |
| Sodium Silicates | cwt. | 1.00 | 5.25 |
| Stabelan E | lb. | 1.35 | 1.50 |
| XL | lb. | .55 | .65 |
| GL | lb. | 1.25 | 1.40 |
| HR Liquid | lb. | .67 | .75 |
| HR Paste | lb. | .85 | .95 |
| HR Powder | lb. | .95 | 1.05 |
| Stabilizer No. 3 | lb. | — | 1.95 |
| Stabilizer No. 42 | lb. | — | .85 |
| Stabilizer No. 52 | lb. | — | 1.95 |
| Stabilizer No. 89X | lb. | — | .75 |
| Stabilizer No. 143 | lb. | — | .85 |
| Stabilizer BC-12 | lb. | — | .90 |
| Stabilizer B-5 | lb. | — | .70 |
| Sodium Silicates | cwt. | 1.00 | 5.25 |
| Stabilizer CH-14 | lb. | — | .65 |
| Stabilizer CH-20 | lb. | — | .65 |
| Stabilizer E6B | lb. | — | .95 |
| Stabilizer E-49 | lb. | — | .60 |
| Stabilizer E-98 | lb. | — | .55 |
| Stabilizer G-1 | lb. | 1.25 | 1.40 |
| Stabilizer HR | lb. | .85 | .89 |
| Stabilizer ICX | lb. | — | .63 |
| Stabilizer I | lb. | — | .60 |
| Stabilizer OM-10 | lb. | — | 1.95 |
| Stabilizer OM18 | lb. | — | 3.25 |
| Stabilizer SN | lb. | — | .48 |
| Stabilizer V-1-N | lb. | — | .43 |
| Stabilizer VL-3 | lb. | — | 1.00 |
| Stabilizer V-7939 | lb. | — | .60 |
| Staflex OV | lb. | — | 1.20 |
| QXMA | lb | — | .70 |
| Staycin 1 | lb. | — | .65 |
| Stayrite 10 | lb. | .32 | .37 |
| P-10 | lb. | .39 | .44 |
| 15 | lb. | .53 | .57 |
| 20 | lb. | .37 | .42 |
| 22 | lb. | 1.40 | 1.44 |

## STABILIZING AGENTS (Cont'd)

| | | | |
|---|---|---|---|
| Stayrite 25 | lb. | .35 | .46 |
| 70 | lb. | — | .70 |
| 80 | lb. | — | .70 |
| 90 | lb. | — | .70 |
| Van-stay L | lb. | .33 | .35 |
| H.T. | lb. | .90 | .92 |
| S | lb. | .65 | .70 |

## STIFFENING AGENTS

| | | | |
|---|---|---|---|
| Calco S.A. | lb. | .85 | .88 |

## SUN CHECKING AGENTS

| | | | |
|---|---|---|---|
| Allied AA-1144 | lb. | .23 | .24 |
| AA-1177 | lb. | .15½ | .16½ |
| Antisol | lb. | — | .23 |
| Antisun (Chipped) | lb. | .15½ | .17½ |
| (Slabbed) | lb. | .15 | .17 |
| Heliozone | lb. | .26 | .27 |
| NBC | lb. | — | 1.55 |
| Sonolite 100 | lb. | .21 | .23 |
| 127 | lb. | .17 | .19 |
| Sunproof | lb. | .30 | .31 |
| 713 | lb. | .25 | .26 |
| Improved | lb. | .25 | .26 |
| Super | lb. | .40 | .41 |
| Jr. | lb. | .20 | .21 |
| Tonox | lb. | .52 | .54 |

## SURFACE ACTIVE AGENTS

| | | | |
|---|---|---|---|
| Aquarex D | lb. | — | .78 |
| MDL | lb. | — | .33 |
| ME | lb. | — | .94 |
| NS | lb. | — | .60 |
| SMO | lb. | — | .50 |
| WAQ | lb. | — | .25 |
| Emulphor EL-620 | lb. | — | .39½ |
| Igepal CO-730 | lb. | — | .36 |
| CO-850 | lb. | — | .36 |
| CO-880 | lb. | — | .36 |
| Igepon CN-42 | lb. | — | .25 |
| T-77 | lb. | — | .49 |
| Sellogen Gel | lb. | — | .12¾ |

## TACKIFIERS

| | | | |
|---|---|---|---|
| Arceo 620-32B | lb. | .20 | .21 |
| 716-30 | lb. | .18 | .19 |
| 1041-21 | lb. | .16½ | .17½ |
| Galex (drums) | lb. | .15¾ | .18 |
| Indopol H-300 | gal. | 1.00 | 1.21 |
| Koresin | lb. | — | .95 |
| Liquid Rubber Flux | lb. | — | .14 |
| Nilox (c.l.) | cwt. | — | 14.50 |
| Resin V | lb. | — | .23½ |
| Rubtack | lb. | — | .12 |
| Synthol | lb. | — | .24¾ |
| Tackifier 1041-21 | lb. | .16½ | .17½ |
| Vistac No. 1 | gal. | 1.00 | 1.21 |
| A | lb. | .21½ | .22¼ |
| Zirex (c.l.) | cwt. | — | 14.75 |

## THICKENERS (FOR LATEX)

| | | | |
|---|---|---|---|
| Alcogum AN-6 | lb. | — | .05 |
| AN-10 | lb. | — | .08½ |
| Betanol (drams) | lb. | — | .70 |
| Emulsorex No. 5 | lb. | — | .35 |
| Good-Rite K-702 | lb. | .34½ | .35 |
| K-704 | lb. | .21 | .22 |
| K-705 | lb. | .31 | .32 |
| K-707 | lb. | .18 | .19 |
| K-708 | lb. | .29 | .30 |
| K-710 | lb. | .15 | .16 |
| Modicol VD | lb. | .13⅞ | .14⅜ |
| VE | lb. | .13⅜ | .14⅜ |
| Polyco 296 BT | lb. | .15 | .16 |
| 296-N | lb. | .15 | .16 |
| 530 | lb. | .15 | .16 |
| Propylene Laurate (dms.) | lb. | .57 | .67 |
| Sodium Silicate, 41°/1:3.2 | cwt. | 1.00 | 2.10 |

## VULCANIZING AGENTS

### Selenium

| | | | |
|---|---|---|---|
| Vandex | lb. | — | 6.00 |

### Sulfur

| | | | |
|---|---|---|---|
| Aero Brand | cwt. | — | 2.40 |
| Blackbird (c.l.) | cwt. | — | 2.85 |
| Cloud (c.l.) | cwt. | — | 2.80 |
| Crystex | lb. | .19½ | .23 |
| Darex Dispersed Sulfur | lb. | .14 | .16 |
| Devil A (c.l.) | cwt. | — | 2.40 |
| Dispersed Sulfur | lb. | .14 | .16 |
| Insoluble Sulfur 60 | lb. | 12½ | .13 |
| Ko-Blend IS | lb. | — | .38½ |
| Mist (Wettable) (c.l.) | cwt. | — | 4.00 |
| Spider (c.l.) | cwt. | — | 2.80 |
| Star (c.l.) | cwt. | — | 3.25 |
| Sulfasan R | lb. | — | 1.50 |
| Tire (c.l.) | cwt. | — | 2.40 |
| Tube (c.l.) | cwt. | — | 3.25 |
| Vultac 2 | lb. | .47 | .74 |
| 3 | lb. | .51 | .78 |

### Tellurium

| | | | |
|---|---|---|---|
| Telloy | lb. | — | 2.50 |

### WETTING AGENTS

| | | | |
|---|---|---|---|
| Advawet No. 10 | lb. | — | .20 |
| No. 33 | lb. | — | .48 |
| Aerosol 18 | lb. | — | .40 |
| AY | lb. | 1.00 | 1.20 |
| MA 80% | lb. | .67 | .72 |
| OT 75% Aqueous | lb. | .63 | .68 |
| OT 100% | lb. | 1.00 | 1.20 |
| Alrosol (dms.) | lb. | — | .40 |
| Alrosperse | lb. | — | .18 |
| Areskap 50 | lb. | .30 | .38 |
| Dry 100 | lb. | .60 | .72 |
| Aresket 240 | lb. | .30 | .37 |
| Dry 300 | lb. | .60 | .72 |
| Aresklene 375 | lb. | .42 | .57 |
| Armacs | lb. | .28 | .77 |
| Arquads | lb. | .24 | .60 |
| Emcol 5100 (dms.) | lb. | — | .37 |
| 5130 (dms.) | lb. | — | .37 |
| Etho-chemicals | lb. | .26 | .58 |
| Kessco E-122 (dms.) | lb. | — | .49 |
| Kreelon 8G (dms.) | lb. | .28 | .30 |
| Lecithin | lb. | .13 | .17 |
| Modicol N | lb. | .42 | .42½ |
| S | lb. | .30⅞ | .31⅜ |
| Orvus AB Granules | lb. | .16 | .17 |
| Nekal NS | lb. | — | .28 |

### WETTING AGENTS (Cont'd)

| | | | |
|---|---|---|---|
| Nopco 1187-X | lb. | .15 | .16 |
| Parnol | lb. | .13 | .18 |
| Selapon Gel | lb. | — | .13 |
| Santomerse D | lb. | .44 | .65 |
| S | lb. | .13 | .25 |
| Sorapon SF-73 | lb. | — | .18 |
| SF-78 | lb. | — | .30 |
| Sorbit P | lb. | — | .28 |
| Stablex G | lb. | .50 | .70 |
| Tergitol 4 (dms., dlvd.) | lb. | .30 | .31 |
| 7 (dms., dlvd.) | lb. | .43 | .44 |
| 08 (dms., dlvd.) | lb. | .30 | .31 |
| P28 (dms., dlvd.) | lb. | .18½ | .19 |
| Trenamine W-30 | lb. | — | .15 |
| Vultamol | lb. | — | .17⅓ |
| Wetsit Conc. | lb. | .25 | .28 |

### MISCELLANEOUS CHEMICALS

| | | | |
|---|---|---|---|
| Aquarex G | lb. | — | .21 |
| Aquasperse 30 | lb. | — | .11 |
| Arccopel W-18 | lb. | — | .18 |
| Copper Inhibitor X-872-L | lb. | — | 2.01 |
| D-Tac | lb. | — | .22 |
| 2-Ethylhexanol | lb. | .25½ | .26½ |
| Fura-Tone Resin 1226 | lb. | .41 | .43 |

### MISCELLANEOUS CHEMICALS (Cont'd)

| | | | |
|---|---|---|---|
| Gen-Tac Resin | lb. | — | .42 |
| MODX | tons | .32½ | .34½ |
| Nullapon BF-12 | lb. | — | .20½ |
| BF-13 | lb. | — | .26½ |
| BF-78 | lb. | — | .61½ |
| Para Resin 2457 | lb. | .04 | .04½ |
| 2702 | lb. | .04 | .04½ |
| 2718 | lb. | .04 | .04½ |
| Pigmented Filmite (dlvd.) | lb. | — | .16¼ |
| Resorcin, Tech. | lb. | .77½ | .78½ |
| Rio Resin | lb. | .60 | .62 |
| Rongalite CX | lb. | — | .22½ |
| Sherosope F | lb. | .17 | .17¼ |
| F-445 | lb. | .17 | .17¼ |
| L | lb. | .18 | .18¼ |
| N | lb. | .18 | .18¼ |
| T | lb. | .18 | .18¼ |
| Sublac Resin PX-5 | lb. | .23½ | .24½ |
| Sulfasan R | lb. | — | 1.50 |
| Synpep | lb. | .54 | .60 |
| Thiokol LP-2 | lb. | .96 | 1.06 |
| LP3, LP32, LP33 | lb. | .96 | 1.06 |
| LP8, LP38 | lb. | 1.25 | 1.37½ |
| Tysonite | lb. | .24 | .24¾ |
| Vanfre | gal. | 2.50 | 3.00 |


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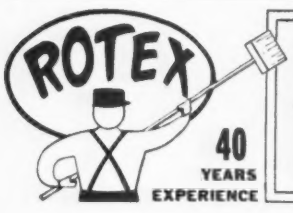


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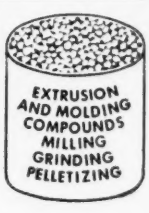

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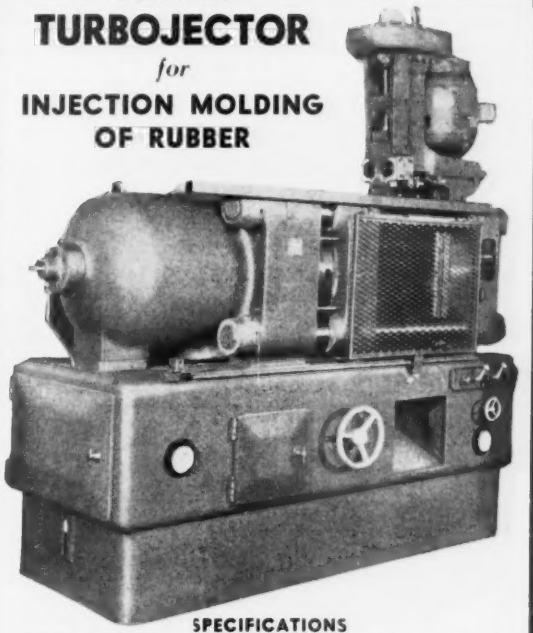

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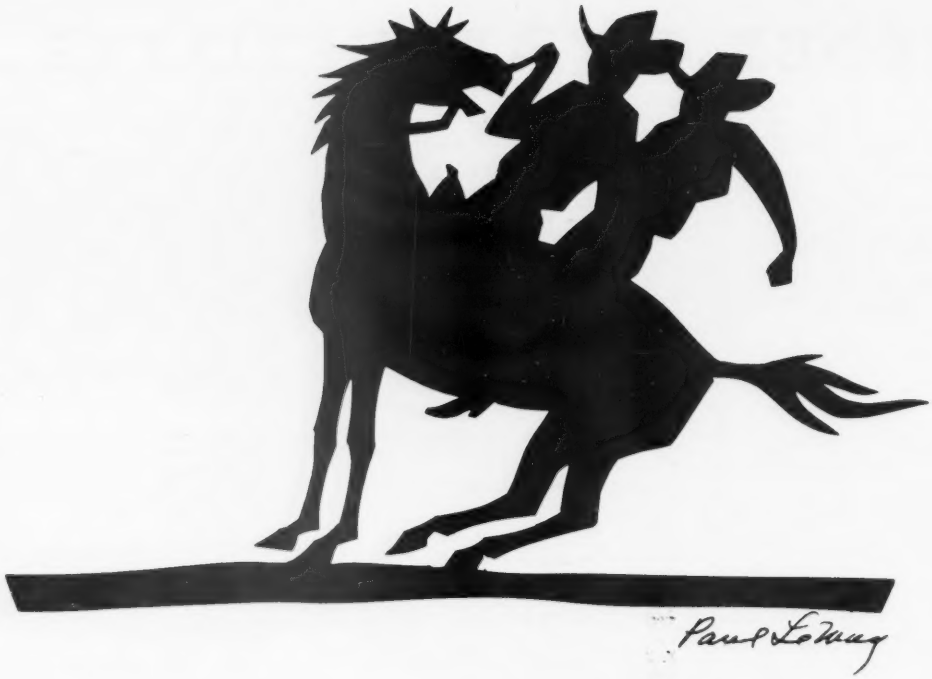


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